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# CHANDLER'S

# ENCYCLOPEDIA

AN EPITOME

OF

## UNIVERSAL KNOWLEDGE

IN THREE VOLUMES

EDITED BY

WILLIAM HENRY CHANDLER, PH.D., F.C.S.

OF THE LEHIGH UNIVERSITY

WITH CONTRIBUTIONS FROM A LARGE NUMBER OF EMINENT SCIENTISTS

*ILLUSTRATED BY COLORED MAPS AND ENGRAVINGS*

VOLUME TWO

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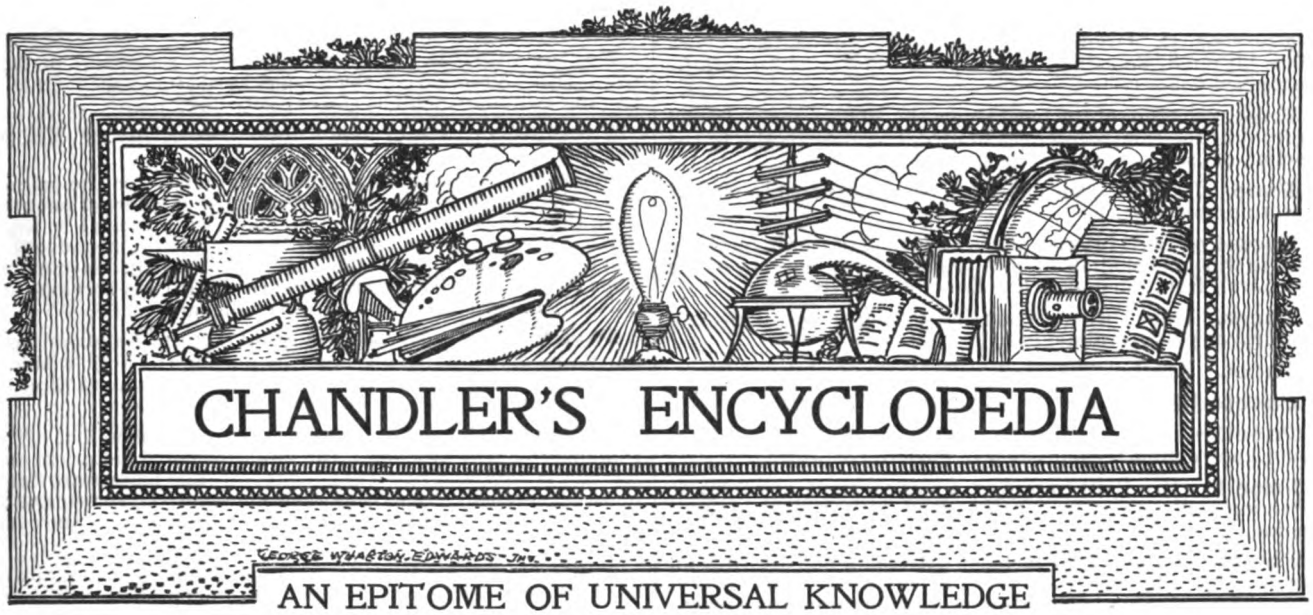



# F

**Faber,** CECILIA BÖHL VON. See CABALLERO, FERNAN.

**Faber,** FREDERICK WILLIAM, D.D., 1814–1863. English poet and theologian, who went from the Anglican to the Roman Ch. 1845. His devotional and controversial works in prose are valued by Catholics, and many of his hymns, 1848–62, are in general use.

**Faber,** GEORGE STANLEY, D.D., 1773–1854. Theologian, uncle of F. W. His *Horæ Mosaicæ*, 1801, writings on Prophecy, 1807–9, and other works have been highly valued.

**Faber,** JACOBUS STAPULENSIS, orig. JACQUES LEFÈVRE D'ETAPLES, ab. 1450–1536. French reformer, condemned 1525, and protected at the court of Navarre. His version of the Bible, 1525–28, promoted the Protestant cause, which he never formally espoused.

**Faber,** or **Heigerlin,** JOHANNES, 1478–1541. Bp. of Vienna 1530; called "Hammer of Heretics," from his book *Malleus in Hæresim*, 1524.

**Fabius Maximus,** QUINTUS, d. ab. 203 B.C. Five times Consul of Rome between 233 and 209 B.C., Dictator 217; famous for his policy of defensive warfare against Hannibal.

**Fabius Pictor,** QUINTUS, ab. 216 B.C. First Roman historian. Considerable fragments in Greek are extant.

**Fables.** Brief fictitious tales, especially those in which the lower animals are endowed with human attributes and language. See BEAST FABLES.

**Fabliaux.** Short verse stories of Old France 1150–1400, ridiculing various classes, especially the priests and nobles. They came from the East, and are opposed to the legends and romances of chivalry.

**Fabre,** MARIE JOSEPH VICTORIN, 1785–1831. Author of eulogies on Corneille and Montaigne, 1808–12. *Literary History of France*, 1810.

**Fabretti,** RAFFAELE, 1618–1700. Writer on Roman aqueducts, inscriptions, and other antiquities.

**Fabriano,** GENTILE DA, ab. 1350–1428. Italian painter, native of the March of Ancona. His best known picture is the *Adoration of the Magi* in the Florence Academy.

**Fabricius,** JOHANN ALBERT, 1668–1736. Prof. at Hamburg from 1699. His *Bibliothecæ* and *Codices* are storehouses of learning, especially that on Greek authors, 14 vols., 1705–28.

Johann Albert Fabricius

The others deal with Latin classics, 1697, mediæval works, 5 vols., 1734–36, and the O. and N. T. Apocrypha, 1703–13.

**Fabricius,** JOHANN CHRISTIAN, 1775–1808. Prof. at Kiel; entomologist.

**Fabrizio,** GIROLAMO, 1537–1619. Prof. of Anatomy at Padua from 1562. Harvey was his pupil. *Opera Chirurgica*, 1617.

**Fabroni,** ANGELO, 1732–1803. Biographer of Lorenzo and Cosmo de Medici, 1784–89, and of *Learned Italians*, 20 vols., 1778–1805.

**Fabroni,** GIOVANNI VALENTINO MATHIAS, 1752–1822. Florentine engineer, savant, and diplomatist; Prof. Pisa 1815.

**Fabulæ Atellanæ.** Early form of Latin comic drama.

**Fabyan,** ROBERT, d. ab. 1513. English chronicler.

**Façade.** Front of a church or other building.

**Façade.** In Architecture, front of a building, used only in reference to extensive and pretentious works, and in general restricted to civil architecture.

**Faccio,** FRANCO, 1841–1891. Italian composer; Prof. at Milan 1868.

**Facciolati,** JACOPO, 1682–1769. Prof. Padua from 1722. With his pupil, Forcellini, he compiled the *Totius Latinitatis Lexicon*, 4 vols., 1771.

**Face.** Portion of the head below the line of the hair and in front of the ears; sometimes limited, but incorrectly, to the portion of the above below the eyebrows.

**Face.** In Mining, surface of ore or coal exposed to view at a working-place.

**Face-Cover.** Interior glacis or mound of earth, formerly used in wide and shallow ditches to protect the masonry of the scarp wall from the destructive fire of distant artillery.

**Faces.** Plane surfaces bounding a solid; planes limiting a dihedral or polyhedral angle.

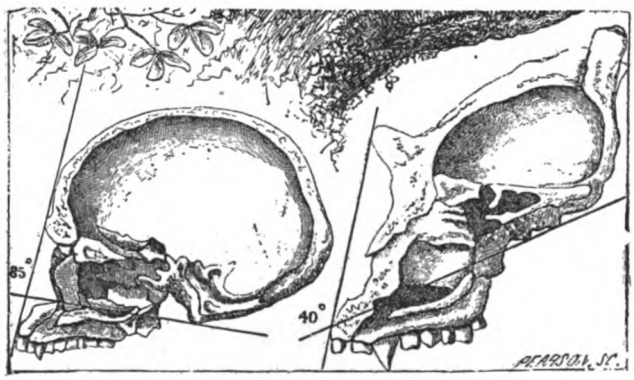
**Facet.** Small plane surface, usually of a crystal or cut gem.

**Faceted Eyes.** See COMPOUND EYE OF INSECTS.

**Facetiæ.** Collection of jests or witticisms, usually indecent; known almost exclusively in modern literature.

**Face Wall.** Built to protect a natural slope of earth; or retaining wall against which the earth is not filled in from behind.

**Facial Angle.** That included between a line drawn from the opening of the ear to the base of the nose and one drawn from the most prominent point of the forehead to the most




Facial Angle (Australian Savage and Gorilla).

projecting point of the upper jaw. Sometimes the foramen magnum is used instead of the ear. See CRANIOMETRY.

**Facial Atrophy.** Disease in which the skin, muscles, and other structures of the face slowly atrophy or waste away. White patches are often observed, and the hair of the affected part bleaches and may fall out. Usually affects one side, the left most often; rarely involves vital parts, and is practically incurable.

**Facial Nerve.** Supplies motor impulses to the muscles of the scalp, external ear, face, eyelids (in part), tympanum, soft palate (in part), and certain of those of the neck; sometimes the name is applied to the trifacial nerves which impart sensibility to the face, etc., and motion to the muscles of mastication.

**Facial Neuralgia.** Pain in the sensory branches of the trifacial nerve. May be located in any portion of the face, usually on one side, and be due to decayed teeth, pressure upon the nerve, rheumatism, malaria, disordered stomach, etc. (see NEURALGIA), and is best treated by hot applications, abundant supply of nourishing food, quinine, and attention to decayed teeth, and in aggravated cases, to gain temporary relief, by anodynes; when accompanied by painful twitching and spasm of the muscles is denominated Tic Douloureux.

**Facial Paralysis.** 1. Loss of motion in the parts supplied by the facial nerve, usually of one side. Inability to close the eye of the affected side is the most prominent symptom; the entire side of the face is flat and expressionless, saliva dribbles from the corner of the mouth, and the food collects between the cheek and gums. It is due to injury or disease of the nerve in its course; exposure to cold, rheumatism, gout, or syphilis are the most common causes. Treatment consists in electricity, massage and strychnine, and is often successful. 2. Somewhat similar condition, but not so marked and without inability to close the eye, caused by disease of the brain, and usually accompanied by paralysis of the opposite side of the body.

**Faciend.** Multiplicand in the higher algebra, where multiplication is non-commutative: term introduced by Hamilton and adopted by B. Pierce.

**Facient.** Multiplier in higher algebra.

**Facing Switch.** One whose movable rails point or face toward the direction of the traffic, as distinguished from a trailing switch, which has the opposite direction.

**Fac-Simile.** Exact reproduction, especially of MS. or drawing.

**Factor.** Commission merchant or agent for the sale of goods consigned to him. One residing in a different country from that of his principal is often liable as principal to third parties; he has a lien on the goods to the extent of his advances and charges, and may pledge them for the lien; his commissions on particular goods are not earned until his services are finished, and are forfeited by gross negligence.

**Factorial.** Continued product of natural numbers from unity to a given limit; indicated by placing the limit within a right angle, as ⌊9, or by placing an exclamation mark after it, as 9! Either of these is read Factorial Nine.

**Factors.** Quantities combined by multiplication. The combination is a product. The number of like factors in any product is indicated by an exponent. Unlike factors are combined algebraically by writing them consecutively, or separated only by a dot. A negative factor changes the sign of the combination.

**Factor's Acts.** Statutes in Great Britain and in many of the U. S., protecting bona fide pledgers and purchasers of goods from factors who are in possession of the goods or of documentary titles thereto.

**Factors of Production.** Things required for making any commodity or product. Such elements are separated for purposes of economic discussion, that the expenses of production or the real supply price may be calculated.

**Factors of Safety.** Ratio of the ultimate strength of a material to the actual or allowable stress. They in practice usually range from 4 to 15 for wrought iron and steel, and from 8 to 30 for timber and stone. They should be higher for variable stresses than for steady stresses.

**Factory Laws.** Laws regulating the length of hours of daily labor for women and children, the sanitary condition of factories, holidays, provisions for safety, to compel the payment of wages in money only, and other arrangements. They were earliest and most highly developed in England, but all advanced countries have now entered on a course of such legislation. Some of these laws have been declared unconstitutional by State courts, as in excess of the police power limit.

**Factum.** Product in the non-commutative multiplication of higher algebras.

**Faculæ,** SOLAR. Brilliant elevations or ridges seen on the sun's surface; most conspicuous near its limbs.

**Facultative Anerobics.** Bacteria that grow either with or without the presence of free air or of oxygen.

**Facultative Conjugation.** That which is optional, as when, among *Protozoa*, conjugation would normally occur but is prevented, in the instance of certain individual zoöids, owing to absence of zoöids of opposite sex, etc. They then resume their self-multiplication method of reproduction.

**Faculty.** In the old psychology, an elementary function of the mind. The extreme theory of faculties regarded the mind as made up of distinct and ultimate units, as will, judgment, memory, imagination, etc., each playing its part in mental operations independently of the others. This view of our mental life has been given up as unsound.

**Faculty.** In Law, indulgence to do something not usually permissible; confined to the ecclesiastical courts.—In colleges and universities the professors and heads of each department form a separate faculty. In the U. S., the term usually comprises all the professors of a university taken collectively.

**Fæces.** The undigested parts of the food together with some of the waste products of the body which is expelled from the body through the anus. They consist three-fourths of water, the rest organic matter mostly. See MANURE.

**Faed,** JOHN, b. 1820. Scottish painter in London 1864–80.—His brother, THOMAS, b. 1826, became R.A. 1864.

**Faenza.** City of Italy 31 m. s.e. of Bologna; pop. 36,100; noted for its manufactures of glazed earthenware painted with designs, hence called Faience, invented here 1299. The term was extended to include all wares between porcelain and common pottery.

Delft Faience Jar

**Faerie Queen.** Allegorical poem by Edmund Spenser, modeled somewhat on Ariosto and Tasso. As projected it was to consist of 24 books: only 6 were written and pub. 1590–96. Book 1, The Red-Cross Knight, or Holiness; 2, Sir Guyon, or Temperance; 3, Britomartis, or Chastity; 4, Cambel and Triamand, or Friendship; 5, Sir Artegall, or Justice; 6, Sir Calidore, or Courtesy.

**Faeroe.** See FAROE.

**Fagaceæ.** Natural family of flowering plants, of the class *Angiospermæ*, and sub-class *Dicotyledons;* trees or shrubs, including the Beeches, Oaks and Chestnuts.

**Fagging.** Custom in English public schools, by which a younger boy was made in effect servant to one in an upper form; now abolished or modified.

**Fagots,** SAP. Short fascines placed between the gabions of a sap to serve as a temporary protection to the sapper; each 3 ft. long and 9 in. in diameter, made of stout picket material. When the parapet of the trench is sufficiently thick to protect the sapper from musketry fire, they are removed and used again at the head of the sap.

**Fagotto.** BASSOON (q.v.). So-called in Italy because when not in use it is taken to pieces and bundled up like a fagot.

**Fagrskinna.** MS. chronicle of the kings of Norway, dating from ab. 1200; burned at Copenhagen 1728; extant in copies.

**Fahlband.** Scandinavian term for certain belts of schistose rock impregnated with metallic ores, chiefly pyrites and blende.

**Fahlcrantz,** CHRISTIAN ERIK, 1790–1866. Swedish poet, Prof. at Upsala 1835, Bp. of Vesteras 1849. He wrote a humorous piece, *Noah's Ark*, 1825, and an epic, *Ansgarius*, 1835–46.

**Fahlerz.** $Cu_8Sb_2S_7$. Tetrahedrite or gray copper ore. It contains variable amounts of sulphur, antimony, and copper, and is frequently rich in silver.

**Fahlunite.** One of the many products of the natural alteration of the mineral iolite.

**Fahrenheit,** GABRIEL DANIEL, F.R.S., 1686–1736. German physicist, inventor (1714–21) of the thermometer named from him. In 1714 his zero was temperature of ice and salt and 24° that of the human body, the freezing point of water was 8°; these degrees were later divided by 4, placing the freezing point at 32°. In 1721 he made a mercury thermometer. After his death the boiling point of water was placed at 212°. These points are determined at a barometrical pressure of 30 in.

**Faidherbe,** LOUIS LÉON CÉSAR, 1818–1889. French general and author; Gov. of Senegal 1852; commander of the Army of the North Dec. 1870; defeated at St. Quentin Jan. 19, 1871. *Numidian Inscriptions*, 1870–72; *Soudan*, 1884; *Senegal*, 1889.

**Faience.** See FAENZA.

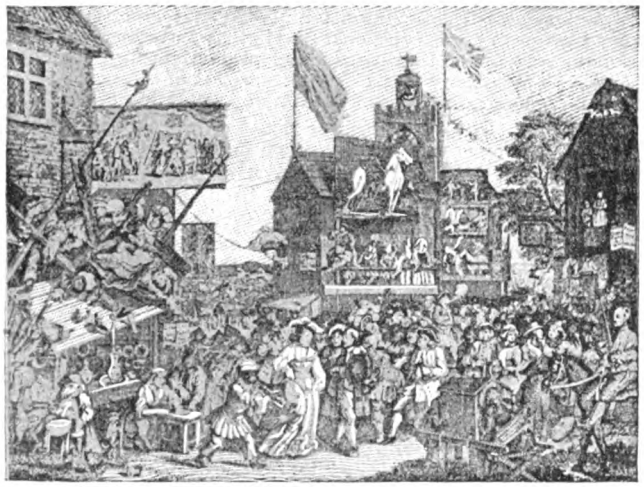
**Faillon,** MICHEL ÉTIENNE, 1799–1870. Historian of the French in Canada, 1865–66.

**Failly,** CHARLES ACHILLE DE, b. 1810. French general, prominent at Solferino 1859, at Mentana 1867, and in 1870, when he was relieved from command of the 5th corps.

**Fainéants,** ROIS. Frankish kings, who were sovereigns only in name. The last Merovingian, Childeric III., was dethroned by Pepin 730.

**Fainting.** Sudden loss of consciousness, usually of slight duration. It may be due to pain, sudden fright, fear, loss of blood, injuries, or any violent mental shock, and is best treated by placing the patient on the back, with the head on the same level as the body, and by mild stimulation.

**Fair.** Collection of farm products, stock, machinery, etc., brought together periodically for exhibition and competition or sale. Formerly, especially in Great Britain, these gatherings were wholly for purposes of sale, but this feature has



Southwark Fair, by Hogarth.

always been kept largely in the background in fairs in the U. S., and has now completely disappeared.

**Fair,** JAMES GRAHAM, 1831–1894. U. S. Senator from Nevada 1881–87.

**Fairbairn,** ANDREW MARTIN, D.D., b. 1838. Scottish theologian. *City of God*, 1882; *Christ in Theology*, 1892.

**Fairbairn,** PATRICK, D.D., 1805–1874. Prof. at Aberdeen 1853, and Glasgow 1856. *Typology of Scripture*, 1845–47; *Prophecy*, 1856; *Pastoral Theology*, 1875.

**Fairbairn,** ROBERT BRINCKERHOFF, D.D., LL.D., b. 1818. Warden of St. Stephen's Coll., Annandale, N.Y., since 1863. *Doctrine of Morality*, 1887.

**Fairbairn,** SIR WILLIAM, LL.D., F.R.S., 1789–1874. Scottish engineer, eminent as a builder of iron ships, bridges, and mills; Baronet 1869; author of sundry technical works.

**Fairbanks,** ERASTUS, 1792–1864. Gov. of Vt. 1852 and 1861. —His brother, THADDEUS, 1796–1886, invented the platform-scale, patented 1831.

**Fairchild,** CHARLES STEBBINS, LL.D. b. 1842. Atty.-gen. of N.Y. 1877–78; U. S. Sec. Treasury 1887–89.

**Fairchild,** HERMAN LE ROY, b. 1850. Prof. Univ. Rochester; sec. Geological Society. *Hist. N.Y. Academy of Sciences*, 1887.

**Fairchild,** JAMES HARRIS, D.D., b. 1817. Prof. Oberlin Coll., O., from 1842, its pres. 1866–89, and its historian 1883. *Moral Philosophy*, 1869; *Theology*, 1892.

**Fairchild,** LUCIUS, LL.D., b. 1831. Gov. of Wis. 1866–72; U. S. Consul at Liverpool 1872–78; U. S. Minister to Spain 1880–82.

**Fairfax,** EDWARD, ab. 1580–1635. English poet. Tr. Tasso's *Jerusalem Delivered*, 1600.

**Fairfax,** THOMAS, LORD, 1611–1671. English general of the parliamentary army; commissioned gen. of cavalry by Parliament 1642; distinguished at Marston Moor, July 2, 1644; commander-in-chief 1645; victor at Naseby, June 14; member of

Lord Fairfax.

Cromwell's first parliament 1654, and of the council of state 1660.

**Fairies,** or ELVES. Imaginary beings, existent under various names and with varying attributes in the legends of nearly every European country; celebrated in many works of English, German, and other literatures, and pre-eminently in Shakespeare's *Midsummer Night's Dream;* subjects of a favorite class of juvenile books, as those of Grimm and Hans Andersen.

**Fairness.** The disposition to contemplate the desires and claims of other persons with as much favor as we do our own.

**Fair Oaks,** or SEVEN PINES, BATTLE OF. May 31 and June 1, 1862, near Richmond, Va.; indecisive Union victory. Confederate loss ab. 6,000, Union loss ab. 5,000.

**Fair Trade.** Economic policy advocated by a party in England, which, while professing not to be opposed to free trade in principle, yet would impose on goods imported from other countries duties equal to the tariff of those countries on similar goods exported from England.

**Fairweather,** MT. Peak of the Cascade range in s.e. Alaska. Altitude 15,500 ft.

**Fairy Rings.** Spots in pastures, more or less bare than the adjoining ground; ascribed by superstition to the dancing of fairies by night; thought to be caused by growth of mushrooms.

**Faith.** Trust in a person, or acceptance of facts or doctrines on testimony. In Biblical definition (Heb. xi. 1), "the assurance of things hoped for, the evidence of things not seen." Faith is the passive acceptance, and belief the active participation in mental adherence to facts and truths.

**Faith,** CONFESSIONS OF. Elaborate statements of doctrine, set forth by authority, as the Augsburg and the Westminster.

**Faith,** RULE OF. With most Protestants, the Scriptures; in R. C. Ch. and with some Anglicans, the Church's teaching.

**Faith Cure.** See FAITH HEALING.

**Faithfull,** EMILY, 1835–1895. English philanthropist, whose specialty was finding or creating occupations for women; founder of the *Victoria Magazine*, 1863–81.

**Faith Healing.** System practiced by Blumhardt (1805–1880) in Würtemberg, and since in Sweden, England, and especially the U. S.; based on the belief that diseases may be cured by prayer and faith (Jas. v. 14), without drugs or medical advice.

**Faithorne,** WILLIAM, ab. 1616–1691. English engraver.

**Faitiere.** In Architecture, French term for the cresting or ridge-ornament of a roof.

**Faizabad,** or FYZABAD. Town of n. Hindostan, capital of Oudh 1730–75. Its history is one of varying decay and growth. Pop., 1891, 79,500.

**Fakirs.** Mohammedan and Brahmin devotees who lead a mendicant life, particularly in India. Many torture themselves to appear to men to be holy. See DERVISHES and GYMNOSOPHISTS.

**Falashas.** Semitic race in Abyssinia, converts to Judaism, who hold by the O. T. and keep the law of Moses; said to number 100,000.

**Falcate.** In Botany, scythe-shaped organs, especially leaves.

**Falcidian Portion.** Fourth of a testator's estate secured to the heir by the *lex Falcidia*, passed under Augustus A. D. 40. A similar rule prevails in La., and imitations of it are found in some common-law States.

**Falciform Process.** See PROCESSUS FALCIFORMIS.

**Falckenstein,** EDUARD VOGEL, 1797–1885. Prussian general, who held important commands in the wars of 1866 and 1870.

**Falcon,** JUAN CRISOSTOMO, 1820–1880. Pres. Venezuela 1863–67.

**Falcone,** ANIELLO, 1600–1665. Neapolitan military painter.

**Falconer,** HUGH, M.D., F.R.S., 1808–1865. Scottish paleontologist, long in India; author of an important work on the geology of the Siwalik Hills, 1846–49, and another on Fossil Elephants. He wrote also on the Antiquity of Man.

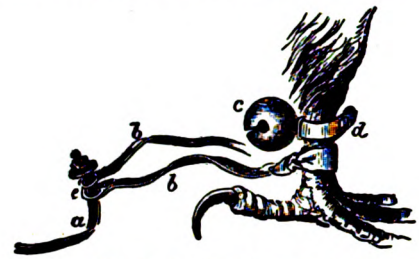
**Falconer,** LANOE. See HAWKER, MARY.

**Falconer,** WILLIAM, 1732–1769. English seaman and poet, author of *The Shipwreck*, 1762, and of a *Marine Dictionary*, 1769; lost in the frigate *Aurora*.

**Falcones.** Section of Raptatores, including *Vulturidæ*, *Accipitridæ* (*Falconidæ*), and *Gypogeranidæ*.

**Falconidæ.** See ACCIPITRIDÆ.

**Falconry.** Art of training falcons for the chase of birds and small quadrupeds; introduced from the East into Europe ab. 500, and into England ab. 860; favorite pastime of nobility of Middle Ages. The falcon, hooded, was carried upon the gloved wrist; when the quarry was discovered, the hood was drawn off, the falcon rose high and pounced upon small birds,




Leg and foot of Hawk, showing the method of attaching the jesses and bell.

*a*, end of the leash; *b*, *b*, jesses; *c*, the bell; *d*, bewitt; *e*, varvels.

harried large ones, and delivered the prey to the falconer, receiving food in return.

**Falcons.** Accipitrine birds of medium or small size, having short, strong beak, with a sharp hook at tip and a strong tooth on each side of upper mandible; legs short and strong, middle toe long, claws much curved and sharp, tail short and stiff, wings long and pointed. There are ab. 50 species, some known as hawks. True falcons have dark-brown irides, and in hunting prey rise high in air above, and swoop down. Hawks chase the prey near the ground. *F. peregrinus* is the most

Falcons (*Falco peregrinus*).

common falcon, dark-bluish above and white below with bars; the young are brownish above and streaked below. The largest falcon is *F. gyrfalco* of the Scandinavian Mountains. Among small falcons are the sparrow-hawk of the U. S. and the kestrel of Europe. They feed on mice and insects. Most falcons take birds, attacking some even larger than themselves. They were trained for hunting the heron, sparrow, etc., in the sport, FALCONRY (q.v.).

**Faldstool.** Litany desk in Anglican churches.

**Faleme.** Branch of the Senegal R., in W. Africa.

**Falerii.** Etruscan city, destroyed by Romans 241 B.C.; rebuilt within a few miles.

**Falernian Wine.** Favorite beverage of ancient Rome, from grapes of n. Campania.

**Falguière,** JEAN ALEXANDRE JOSEPH, b. 1831. French sculptor and painter.

**Falieri,** MARINO, 1274–1355. Doge of Venice 1354; previously eminent in war; celebrated by Byron. He plotted overthrow of the patricians, and was decapitated.

**Faliscus,** GRATIUS, 1st century B.C. Latin poet. His *Cynegetica* treats of hunting.

**Falk,** PAUL LUDWIG ADALBERT, b. 1827. Prussian Minister of Worship and Education 1872–79. See FALK LAWS.

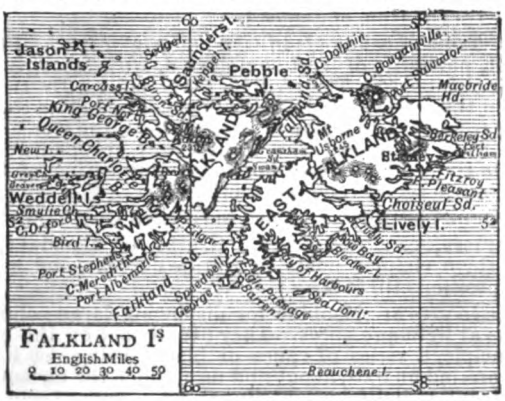
**Falkirk.** City of Scotland 22 m. n.e. of Glasgow, near the wall of Antoninus; site of victory of Edward I. over the Scots commanded by Wallace July 22, 1298; some 20,000 of the latter were slain. At F. Muir Prince Charles Edward defeated the royalists under Hawley Jan. 17, 1746. Pop., 1891, 16,615.

**Falkland,** LUCIUS CARY, VISCOUNT, 1610–1643. Member of the Long Parliament 1640; a man of singular accomplishments, who saw the evils of each party, reluctantly took the King's

Lucius Cary, Viscount Falkland.

side, was heartbroken by the war, constantly sighing, "Peace, peace," and went joyfully to his death at Newbury.

**Falkland Islands.** Group in the Atlantic e. of the Straits of Magellan, belonging to Great Britain. It consists of two large islands, E. and W. F., and ab. 100 islets, treeless and




almost barren. They were discovered 1592, named 1689, settled by the French 1763, taken by England 1765 and 1833, and used as a penal colony till 1852. Pop., 1891, 1,789.

**Falk Laws.** Passed by Prussian Diet 1872–75, restricting the influence of the R. C. clergy on popular education, and defining their relations to the State. Their rigor was relaxed 1879, when Bismarck chose to seek the support of the clerical party.

**Falkner,** THOMAS, 1707–1784. English Jesuit, missionary in S. America 1733–67. *Patagonia*, 1774.

**Falkoeping.** In Sweden, scene of defeat of Albert, king of Sweden, 1389, by Margaret of Denmark.

**Fall.** Rope used with hoisting pulleys.

**Fallacy.** Error in reasoning, arising either from equivocation or from presumption. The former is of composition and division, resulting from a confusion of collective and distributive terms, and of accident, from the confusion of concrete and abstract meanings of the same terms. The latter consists either in the assumption of unproved premises, which is a begging of the question, or in the introduction of new and irrelevant matter into the conclusion; it is the fallacy of inconsequence, or non sequitur.

**Fallet,** NICOLAS, 1753–1801. French poet and dramatist. *Barnevelt*, 1775; *Matthieu*, 1783.

**Falling Bodies,** LAWS OF. A free body acted on by a constant force will obey certain laws expressed by formulæ. $v=v_0+gt$; $h=\frac{1}{2}gt^2$; in which v denotes the velocity at the end of an assumed time t, $v_0$ the initial velocity of the body at the beginning of t, g the acceleration due to gravity, which is 32.187 ft. per second in these latitudes, and h is the height or space through which the body will move under assumed values for t. The velocity v due to a fall from a given height $h=\sqrt{2gh}$; the height h corresponding to a given velocity v is $h=\frac{v^2}{2g}$; the height of fall in a given time$=\frac{1}{2}gt^2$; the velocity acquired at the end of a given time$=gt$. When the body is projected upward or downward the problems are solved by giving proper values to the initial velocities or spaces, and proper signs to the acceleration g, according as it acts with or against the initial impulse.

**Falling Sickness.** See EPILEPSY.

**Fallmerayer,** JACOB PHILIP, 1791–1862. German traveler and Orientalist, Prof. at Landshut 1826–30; historian of *Trebizond*, 1827, and of *Morea in the Middle Ages*, 1830–36.

**Fall of Man.** Transgression of Adam and Eve (Gen. iii.), involving, on one principle or another, their descendants.

**Fallopian Tubes.** One on each side, ab. 5 inches in length, running up from the upper portion of the uterus toward the ovaries. Their upper ends expand and are fringed; they receive the ovum and convey it into the uterus.

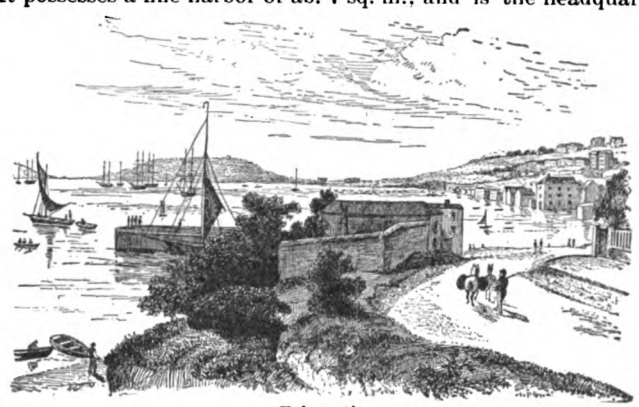
**Fallopius,** GABRIEL, 1523–1562. Prof. of Anatomy at Pisa 1548, and at Padua from 1551. *Works*, 4 vols., 1600.

**Falloux,** FRÉDERIC ALFRED PIERRE, COMTE DE, 1811–1886. French legitimist, Academician 1857; historian of Louis XVI., 1840, and Pius V., 1844. *Mme. Swetchine*, 1859.

**Fallow,** SUMMER. Practice formerly more common than now of preparing land for wheat by plowing early in the spring and then repeatedly thereafter during the season. This practice results in a great increase of crop on lands of a stiff heavy nature and of great natural fertility, though if it alone is depended upon the lands will in the end become largely depleted of their fertility. It is also useful, when thoroughly carried out, in clearing foul lands of weeds.

**Fall River.** City of Bristol co., Mass., at the head of Mt. Hope Bay and mouth of Taunton R. It has 3 railroads and considerable commerce. The leading industry is cotton manufactures; in this it is one of the principal centers of the world. It was founded 1656 and chartered 1854. Pop., 1890, 74,398, half of foreign birth.

**Falmouth.** Seaport on s. w. coast of Cornwall, England. It possesses a fine harbor of ab. 7 sq. m., and is the headquar-



Falmouth.

ters of the pilchard fishery. Its climate is the mildest in England, and the neighboring scenery is beautiful. Pop., 1891, 41,273.

**False Assumption.** Old method of solving equations, assuming a value for the unknown quantity, noting how nearly this meets the given conditions, and then changing the assumption by simple proportion.

**False Attack.** Demonstration in force against some point of a fortified position, to deceive the enemy and weaken if possible his strength at some other point, where the main attack is to be delivered. It sometimes happens that an unexpected success is gained, and the false converted by good generalship into the true attack.

**False Imprisonment.** Unlawful restraint of one's personal liberty. It may be committed by words or acts operating on the will of the victim, as well as by actual restraint of the body. Unlawful shadowing of a person by a detective has been thus held.

**False Pretenses.** Intentional lie by words or acts, inducing the victim to part with any property of value. Its grade and punishment are regulated by statute.

**Falsetto.** False or unnatural voice differing from the chest and head voices; generally used by men who sing ALTO (q.v.).

**False Works.** Structure of timber built for the purpose of erecting a bridge, and removed when the bridge is completed. Those used for the erection of arches are called centering.

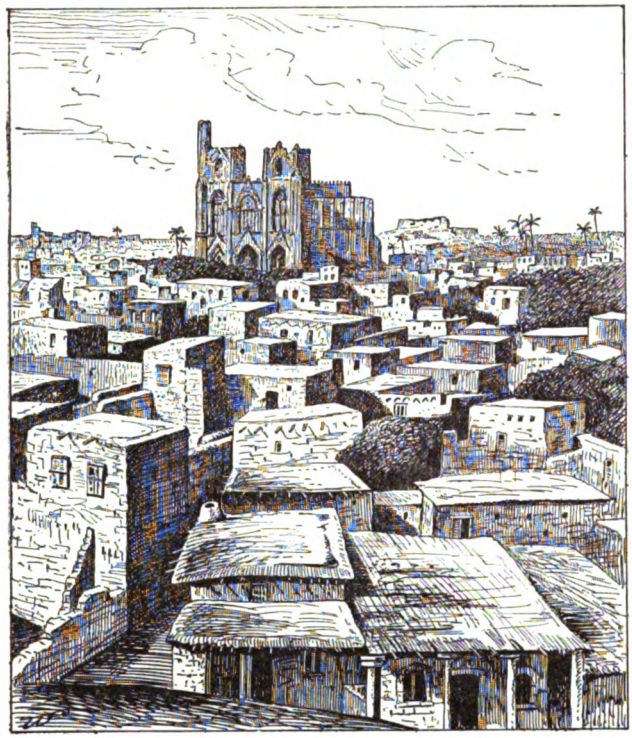
**Falster.** Danish island, s. of Zealand. Area 183 sq. m.; pop. 35,000.

**Falster,** CHRISTIAN, 1690–1752. Danish poet, satirist, and philologist.

**Falun.** Town of Sweden, noted for copper mines, which in 1650 produced 3,100 tons, and now 400 annually. Pop., 1891, 8,010.

**Fama.** Goddess of rumor, celebrated by Greek and Latin poets.

**Famagosta.** Seaport of e. Cyprus, once important commercially; now the harbor is choked up by sand and does not



Famagosta, the ancient Venetian port of Cyprus.

admit large vessels, while its palaces, churches and defenses are in ruins. Taken by Turks 1571; ruined by earthquake 1735. Pop., 1891, 3,367.

**Familiars.** Servants of the Inquisition, especially in Spain.

**Familiar Spirits.** Supposed attendants of wizards or magicians; mentioned frequently in O. T.; objects of fear and wonder to ancient and mediæval superstitions.

**Familists.** Dutch mystical sect, founded by H. Nicolas, 1502–ab.1562; transplanted to England under Edward VI.; partly suppressed under Elizabeth. They were not Anabaptists or Antinomians, as often supposed.

**Family.** In Botany, group of closely related genera, as the *Betulaceæ* or Birch family, which includes also the Alders and Hornbeams. The name usually ends in *aceæ*.—In Zoölogy, assemblage of genera having some common characteristic. The term designating the family always ends in *idæ*, and that of the sub-family in *inæ*. See CLASSIFICATION.

**Family.** That natural element of society which consists of the parents, children, and such persons as live together in one house. The term is sometimes extended to include many households and several generations of one common stock.

**Family Compact.** Treaty between the members of the House of Bourbon, signed at Versailles Aug. 15, 1761, establishing a defensive alliance of France, Spain, and the two Sicilies. It led to war with England, as had one between France and Spain 1733.

**Family of Love.** See FAMILISTS.

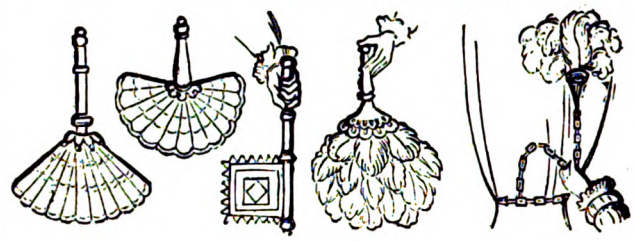
**Family of Surfaces.** Those generated by lines taking successive positions with arbitrary changes, preserving for the surfaces the same general character.

**Family System of Industry.** Period in which all the necessities of life were produced within the limits of one household, or at most, of one communistic group. In backward communities it survived with little breach of completeness to late times, as in mediæval England and modern Russia.

**Famine Fever.** See TYPHUS FEVER.

**Famines.** Failures of food supplies entailing fearful suffering have been frequent in history. At Rome 436 B.C. thousands threw themselves into the Tiber. In Britain people ate the bark of trees 272; thousands died 306; 40,000 perished 310; great mortality 729, 823, 954–8, 1016, 1087, 1193–95, 1251, 1315, 1335, 1353, 1438, 1565, 1748, 1795 and 1801. Parents ate their children in Italy 450; France suffered very much 1695; Bengal was devastated 1771; 16,000 died at Cape de Verde 1775; 800,000 perished in n.w. India 1837–38; a million in Bengal 1865–66; 1,500,000 in Rajpootana 1868–69; in Bengal $32,500,000 were spent on relief 1874; 500,000 died in India 1877; and ab. 9,500,000 in China 1877–78.

**Fan.** Implement for producing a current of air. Ancient fans were of elegant forms, delicate colors, and costly materials. They were seldom employed by the owners as at present, but by the hands of female slaves and eunuchs. Feather fans were common and came into Europe with the



Fans.

Crusades. In the 17th century the handles were sold separately and were composed of gold, silver, and ivory, elaborately worked and sometimes set with gems. The Italian fans were flag-shaped, and the ribbed folding fan was not introduced till the time of James I.

**Fan.** Tribe of cannibals in w. equatorial Africa. Slender, well-built, powerful, of light complexion, with strongly-developed hair and beard. Their villages are built with two long streets, in the forest; the houses are small and close together. Clothing is reduced to a skin or wisp of grass, the women wearing less than the men. The front teeth are pointed. The women do the work, but are honored. The eating of human flesh is done in secret religious services.

**Fan,** ORDER OF THE. Founded in Sweden 1744; now extinct.

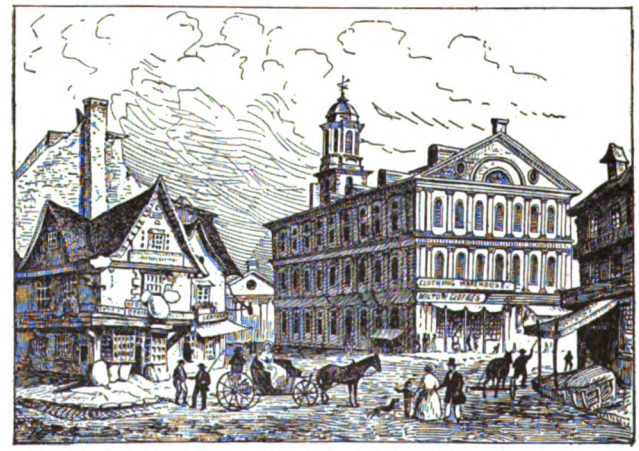
**Fanarists,** or PHANARISTS. Greeks of Constantinople. Some of them claimed noble Byzantine descent, and held important positions till 1822.

**Fan Blowers.** Machine for displacing large volumes of air or gas at light pressures. They usually act on the centrifugal principle, a series of vanes or blades being set in rapid rotation around an axis, about and near which the air enters, to be forced out radially by centrifugal force and expelled tangently from the tips of the blades at the circumference of the casing. They are used principally for ventilation of mines and buildings, and to stimulate combustion in furnaces. A form of exhaust fan in which the current of air moves parallel to the revolving shaft uses vanes which are parts of helical or inclined surfaces, so that the air behind the fan is cut and forced endwise by the successive rotating vanes. This type has best efficiency under very light frictional resistances in the ducts.

**Fancy.** Faculty allied to imagination, but usually credited with lighter character and assigned to lower rank.

**Fandango.** Spanish national dance, in $\frac{3}{4}$ time.

**Faneuil Hall.** In Boston, Mass.; erected 1742 by Peter Faneuil (1700–1743), a merchant of Huguenot descent, and pre-



Faneuil Hall, Boston, 1840.

sented to the town; burned 1761: rebuilt 1763; width increased by 40 ft., and one story added 1805; called the "Cradle of Amer-

ican Liberty," from the meetings held in it before and during the Revolutionary war.

**Fanino,** FAVENTINO, d. 1550. Italian Protestant martyr.

**Fanning,** JOHN THOMAS, b. 1837. American civil engineer, constructor of many water-works; author of *Water Supply Engineering*, 1877.

**Fannius Strabo,** CAIUS. Roman orator, Consul 122 B.C.; author of a history whereof fragments remain.

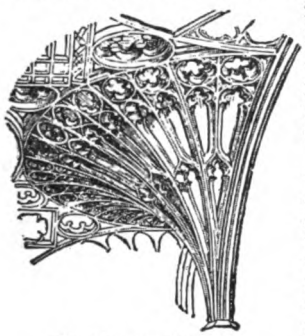
**Fanshawe,** SIR RICHARD, 1608–1666. English envoy to Portugal 1661, and to Spain 1664; tr. Guarini's *Pastor Fido*, 1647, and Camoen's *Lusiad*, 1655.

**Fán t'án.** Well-known Chinese gambling game, carried on by organized companies, and played with coins or buttons, which are concealed at random under a metal cup. The dealer counts off the concealed objects in fours, and the final remainder, whether one, two, three, or none, determines the winning side of a square, numbered from one to four, upon which the bets are made. A divinatory origin may be assumed for the game, which is clearly related to the fortune-telling schemes in which both board and counters bear a cosmical import.

**Fantasia.** Musical composition free in form; in a popular sense, generally a potpourri of operatic or other airs, embellished with showy passages, arpeggios, etc. In the early days of instrumental music the term seems to have been generic, the pieces to which it was applied being undistinguishable in form from those called sonatas, toccatas, etc.

**Fantoni,** GIOVANNI ("LABINDO"), 1755–1807. Ital. lyric poet.

**Fan Tracery Vaulting.** Found only in English Gothic architecture, principally of late Perpendicular style. The ribs, rising from the springing of the vault, diverge equally like the folds of a fan, and are accompanied by elaborate geometric carved work.



Fan-Tracery Vaulting.

**Farad.** Practical unit of electrical capacity, named from Faraday. It is equal to $10^{-9}$ C.G.S. electromagnetic units of capacity; or to $9 \times 10^{11}$ electrostatic units. A sphere of $9 \times 10^{11}$ centimeters radius has a capacity of one farad; but for convenience the standard in use is the microfarad or the millionth of a farad.

**Faraday,** MICHAEL, D.C.L., F.R.S., 1791–1867. English chemist and physicist, Prof. Royal Inst. from 1827; pensioned 1835. His chemical work was soon overshadowed by his discoveries in experimental electricity. His first important discovery was the production of the continuous rotation of magnets and of wires conducting electric currents. The crowning discovery was that of the induction of electric currents. The magnitude of this discovery may be estimated only by tracing the subsequent history of the subject. His chief works are: *Chemical Manipulation*, 1827; *Experimental Researches in Electricity*, and in *Chemistry and Physics; Chemical History of a Candle; On the Various Forces in Nature.*

Michael Faraday.

**Faraday's Laws** OF ELECTROLYSIS. 1. The electrolyte must be a conductor. 2. The quantity of an electrolyte decomposed in a given time is proportional to the strength of the current. 3. The quantities of the electrolytes decomposed by the current are in the ratio of their chemical equivalents.

**Faráizi.** Reformed Mohammedan sect of e. Bengal, formed ab. 1850. They reject tradition and adhere to the Koran alone.

**Farallones.** Six small islands of the Pacific, ab. 30 m. w. of San Francisco; resort of sea-birds and sea-lions.

**Farce.** Humblest order of drama, aiming merely to amuse; therein differing from comedy, which should delineate character and manners. Its beginnings were probably rustic, among the early Greeks and Romans, and in mediæval Italy. Its place is important on the modern stage, but in literature very small.

**Farcy.** Contagious and malignant disease of horses, mules and asses, communicable to man, characterized by ulceration of the lymphatic glands and due to a specific micro-organism; it is incurable.

**Farel,** GUILLAUME, 1489–1565. French reformer, evangelist of Switzerland from 1523. He induced Calvin to stop in Geneva 1536.

**Farewell Cape.** Southern point of Greenland, a high rocky islet off the coast nearly always ice-bound.

**Fargus,** FREDERICK JOHN ("HUGH CONWAY"), 1847–1885. English novelist. *Called Back*, 1883; *Dark Days*, 1884.

**Faria y Sousa,** MANUEL DE, 1590–1649. Portuguese historian and poet, resident at Madrid from 1634. His posthumous books on Portuguese Asia, Europe, and Africa, with a commentary on the *Lusiad*, 1639, and many of his lyrics, were written in Spanish.

**Farid-Uddin Attar,** 1119–1230. Poet at Bagdad who attained great fame and was slain at the siege of Naishapur. Much of his verse survives.

**Farina.** See STARCH.

**Farinelli (Broschi),** CARLO, 1705–1782. Italian singer. His success in London compelled Handel to abandon operatic management for oratorio. In 1736 he went to Spain and exerted political influence as the favorite of Philip V., whose melancholy was soothed with his singing. In 1759 he retired to Bologna.

**Farini,** CARLO LUIGI, 1822–1866. Italian historian and statesman, exiled 1843 and 1848; Cabinet Minister 1861–63. *Hist. Roman State*, 1815–50, was tr. in part 1859.

**Farinose.** Surfaces of organs of plants covered with a white or gray powder.

**Farjéon,** BENJAMIN LEOPOLD, b. 1833. English novelist. *Grif*, 1870; *Silver Flagon*, 1876; *Toilers of Babylon*, 1888.

**Farkle Berry.** *Vaccinium arboreum.* Tall shrub of the natural family *Ericaceæ*, native of the s.e. U. S.

**Farmer,** HUGH, 1714–1787. English Independent of rationalizing tendency. His books on *Our Lord's Temptation*, 1761, on *Miracles*, 1771, and on *The Demoniacs of N. T.*, 1775, were landmarks of religious thought and biblical interpretation.

**Farmer,** RICHARD, D.D., 1735–1797. Librarian Univ. Cambridge 1778. *On the Learning of Shakespeare*, 1766. He declined an Irish and an English bishopric.

**Farmers' Alliance,** or LEAGUE. See FARMERS' ORGANIZATIONS.

**Farmers-General.** Privileged persons who in France till 1789 purchased or leased the right of collecting taxes, in whole or part, and enriched themselves thereby. This abuse contributed largely to the causes of the Revolution.

**Farmers' Organizations.** These, for purposes of mutual improvement and for holding exhibitions of agricultural products, are almost as old as the country. It is only within the past 25 years that they have assumed a political character. The first of these was the Order of Patrons of Husbandry, or Grangers (the local organizations being known as Granges), based on a secret ritual, and having for its objects the advancement of its members socially and mentally, as well as the improvement of their pecuniary condition by means of coöperation in buying and selling. Following this came the Farmers' Alliance and the Farmers' Agricultural Wheel, both with similar objects and somewhat similar organization. The Grange has spread its membership pretty generally over the country; the Alliance is confined mainly to the West, and the Wheel to the Southwest. Much more recently the Farmers' Political League has been organized with the avowed object of procuring more and better legislation on subjects most nearly interesting the farmer. Its organization is non-secret and non-partisan, and it has already attained considerable prominence.

**Farming,** LARGE AND SMALL. There has been a long contest among economists as to the relative advantages for the nation of a system of large farms, say such as average 200 to 500 acres, and of small farms, say from 10 to 20 acres. English custom and theory have generally supported the former, the Continental countries of Europe the latter.

**Farnese,** ALEXANDER, DUKE OF PARMA, 1546–1592. General of Philip II.; distinguished at Lepanto 1571; Gov. of the Netherlands 1578. He invaded France 1590, and was eminent in war and in diplomacy.

**Farnese Bull.** Colossal marble group by Apollonius and Tauriscus of Tralles ab. 300 B.C. It represents the punishment of

Farnese Bull.

Dirce for ill-using her mother. It was discovered 1546, restored, placed in the Farnese Palace, and afterward removed to Naples.

**Farnesina Villa.** At Rome, built for the Chigi family, 16th century. It contains frescoes from Raphael's designs of the story of Cupid and Psyche, and the Galatea fresco by Raphael.

**Faro.** Game of cards, with a full pack, shuffled and placed in a dealing-box, which is open at the top, the pack being forced against the top rim by springs below and the top card being withdrawn through a slot at the side. An extra suit of cards is fixed upon the center of the table, upon which the bets are laid as the players may elect. The dealer discards the top card, the next card is for the bank, and the following for the players, who lose or win their stakes, dependent upon whether the card they bet upon agrees in denomination with that of the bank or their own. If the two cards are of like value, the bank takes half the bet, a Split. A player may bet to lose, which is called Coppering a bet. The player's card remains upon the pack till the bets are made, when it is withdrawn for another turn. A player winning on the order of the last three cards, being of different values, receives 4 to 1, a Call; or, being two of one denomination and one of another, he wins 2 to 1, a Cat. There are many combinations in the betting. The advantage of the bank is only the Splits and Calls, which amounts to not more than 1 per cent, which is less than any other game. The progress of the dealing is kept by the player upon a card, so that he may know what cards remain to be dealt.

**Faroe Islands.** Midway between Iceland and the Shet-

land Islands; colonized in the 9th century from Norway; transferred to Denmark 1380. Area 513 sq. m.; pop., 1890, 12,954.

**Farquhar,** GEORGE, 1678-1707. Irish dramatist. *Constant Couple*, 1700; *Beau's Stratagem*, 1707.

**Farr,** WILLIAM, M.D., D.C.L., F.R.S., 1807–1883. Supt. of Statistical Dept. in office of British Registrar-gen. *Lifetimes, Annuities, and Premiums*, 1864; *Accident Insurance*, 1880; *Vital Statistics*, 1885.

**Farragut,** DAVID GLASCOE, U.S.N., 1801–1870. Commander 1841, Captain 1855; famous for the capture of New Orleans, April 25, 1862, and of Mobile, Jan. 1864, having opened the Mississippi in the interval; Rear-admiral 1862, Vice-admiral 1864, and Admiral 1866, the last two grades being created in his honor.

**Farrand,** LIVINGSTON, M.D., b. 1867. Instructor in physiological psychology, Columbia Coll., 1893.

**Farrant,** RICHARD, ab. 1530–1585. English Ch. music composer; organist of St. George's Chapel 1564–69, and of the Chapel Royal 1569–80.

**Farrar,** ADAM STOREY, D.D., b. 1826. Prof. Univ. Durham 1864, Canon 1876. *Critical History of Free Thought* (Bampton Lectures), 1862.

**Farrar,** FREDERIC WILLIAM, D.D., F.R.S., b. 1831 at Bombay. Canon of Westminster 1876, Archdeacon 1883, Dean of Canterbury 1895; prolific and popular author. Besides stories for boys, sermons, and books on language, he has pub. *Seekers after God*, 1869; *Witness of History to Christ*, 1871; *Life of Christ*, 1874; *Eternal Hope*, 1878; *Life and Work of St. Paul*, 1879; *Early Days of Christianity*, 1882; *Messages of the Books*, 1884; *History of Interpretation*, 1886; *Solomon*, 1887; *Lives of the Fathers*, 1889.

**Farren,** ELIZA, 1759–1829. English actress, who became Countess of Derby 1797.

**Farren,** WILLIAM, b. 1825. English actor, prominent in comedy.

**Farrier.** Horse-shoer; in old times also a horse-doctor, but this branch of farriery is now confined to the properly qualified veterinary surgeon.

**Farthing.** English coin, fourth of a penny; sometimes struck in silver till ab. 1550; common in copper since 1715.

**Farthingale.** The under-supporters of the wide petticoat fashionable in the 16th century, the precursor of the hoop and

Progress of Queen Elizabeth of England.

crinoline. It came originally from Spain and lasted in France and England from ab. 1570–1620.

**Fasces.** Bundle of elm or birch rods anciently borne by lictors before Roman magistrates as insignia of authority. The consul had 12 fasces, the dictator 24, prætors of the towns 2, and those of the army and provinces 6. At funerals the fasces were lowered.

Fasces.

**Fascia.** Thin broad masses of fibrous tissue, which unite many tissues or serve to retain them in position.

**Fasciation.** Teratological process by which stems or other organs of plants become laterally united.

**Fascicle.** Group or cluster of leaves or other organs, as

the leaves of the Larch and Pine, the fleshy roots of the Dahlia, and certain sessile flower-clusters.

**Fasciculus.** Dense flower-cluster of the cymose type.

**Fascination.** Power of rendering their victims immovable and incapable of defense possessed by venomous serpents; it exists to a certain extent and is a phenomenon akin to hypnotism.

**Fascination,** HUMAN. Besides the ordinarily accepted meaning, viz., a mysterious, irresistible influence upon the mind, the term has acquired a more specific reference to a certain physical condition characterized by a tendency to muscular contraction of an involuntary sort, but accompanied by consciousness, which is often induced in the early stages of the hypnotic trance.

**Fascines.** Brush or branches tied together in bundles and used to make mattresses for foundations of embankments and jetties in marshy or muddy bottoms. In Russia piers of large bridges have been founded on fascine mattresses. Used for riveting the steeper slopes of field works.

**Fascioles,** or SEMITÆ. Lines on the surface of spatangoid Echinoderms, covered with the clavulæ.

**Fashion.** Temporary prevailing custom, a matter of capricious taste established by the few and deferred to by the many. Though the tyranny of fashion is most noticeable in COSTUME (q.v.), it is just as despotic in furniture, sculpture, painting, music, and literature. It goes even further, for philosophy in Athens, suicide in Rome, and piety in Florence have been the fashion at various times. In England, learning in the 16th century, puritanism and license in the 17th, the Grand Tour and dilettanteism in the 18th were successively fashionable, while in France religion and riot alternated with atheism and the Rights of Man. Among savages fashion is equally strong. The Chinese deformed foot, Siamese long finger-nails, Guinea broken noses, American flat-heads, and Hottentot Venuses with extraordinary buttock development are instances. Add to these nose-, ear-, and lip-perforation, and tattooing; proof that fashion may demand even self-mutilation.

**Fassig,** OLIVER, b. ab. 1860. Librarian of U. S. Weather Bureau. *Bibliography of Meteorology*, Parts I.–IV.

**Fasti.** Latin official calendars giving the days on which business could or could not be transacted, forming a kind of almanac: later, brief official registers kept by magistrates. The consular fasti, upon marble tablets, now in part preserved in the Capitoline Museum, and the Prænestine fasti, found 1770, are valuable historical documents. Dies fasti were days on which the prætor could give judgment, or court-days, or on which the senate or assembly could be summoned. Ovid's *Fasti* treated of Roman festivals.

**Fastigiate.** In Botany, branches which are nearly erect and parallel.

**Fasting,** CLAUS, 1746–1791. Norwegian critic, dramatist, and poet.

**Fastolf,** SIR JOHN, ab. 1378–1459. English officer in the French wars; supposed original of Shakespeare's Falstaff.

**Fastnets,** THE. Cluster of rocks 4 m. s.w. of Cape Clear, Ireland, on one of which stands a lighthouse with a revolving light visible 18 m.

**Fasts.** Days appointed by usage or Ch. authority for partial or total abstinence from food. In O. T. the Day of Atonement was the only enjoined fast. In N. T. fasting is recognized, but not enjoined. The R. C. Ch. has many fasts, the Greek many more and much severer.

**Fat.** Solid or semi-solid substance insoluble in water, capable of forming an emulsion when agitated with albumen, blood serum, etc., and of being converted into glycerine and fatty acids, found widely distributed through the animal and vegetable kingdoms. It serves to protect the various parts of the body in which it is found and is stored up to be drawn upon when not supplied in the food. A very large portion of the potential energy of the body is derived from fat, of which about three ounces daily is needed: in addition to that supplied directly and to that derived from the carbohydrates, a small amount is obtained from the nitrogenous elements of the food. About 18 per cent of the weight of average adults consists of fat. The fats are combinations of the glyceryl group $CH_2.CH.CH_2$, derived from glycerine with acids of the acetic acid class mainly. Other acids, as oleic, are also present. The compounds are called glycerides. A fat is always a mixture of various triglycerides, and therefore contains several acids. Upon saponifying the fats, glycerine is always obtained as one of the products. Fats are important constituents of fodders, used by animals mainly as a source of heat and of animal fat. Green fodder contains from 0.27 per cent in ensilaged rye fodder to 1.16 per cent in the soja bean, whole plant. Dry fodder contains from 1.24 per cent in maize fodder to 2.87 per cent in cow pea vines. Ruta bagas have 0.09 per cent, mangolds 0.20 per cent, and red beets 0.18 per cent. Maize meal has 3.72 per cent. See GLYCERIDE.

**Fat Acid,** or FATTY ACID. Monobasic acids present in combination in the animal and vegetable fats; to a certain extent, the whole acetic acid series.

**Fatalism.** Theory which assigns such an unalterable fixity to the course of events that no human will can change it; extreme form of determinism.

**Fata Morgana.** Form of mirage over the Straits of Messina, in which distant objects, castles, cities, palaces, are seen apparently on or even below the surface of the sea; also similar phenomena elsewhere, especially in Egypt, Arabia, and the Sahara, where distant lakes are imagined.

**Fat Coal.** Coal containing a large amount of volatile matter.

**Fate.** In ancient Greek and Roman beliefs, necessity to which the gods as well as men were subject. In Christian theology, as developed by Augustine and Calvin, and in Mohammedanism, it is made dependent on divine will and decree.

**Fates.** Deities presiding over human destinies; three daughters of Night. Clotho who spins out the thread of life, Lachesis who assigns to man his fate, Atropos who cannot be

Fates.

avoided. They are usually represented as hideous hags with attributes respectively of the spindle, staff and globe, and shears.

**Fathers of the Church.** Commonly reckoned as the great orthodox writers down to John of Damascus in the East, d. 754, and Pope Gregory I. in the West, d. 604. They are classified as Apostolic, ante-Nicene, and post-Nicene.

**Fathom.** Unit of measure, six feet long, used by sailors in soundings, and by English miners; corresponding to the German Lachter or Klafter. In mines of the U. S., the foot or yard is commonly employed as the unit.

**Fatigue of Materials.** Deterioration in strength caused by heavy stresses applied for a long time or at frequent intervals. It has been shown that materials subject to repeated stresses exceeding the elastic limit will break after a large number of applications of stress, none of which approaches the static ultimate strength. In the case of steel, many phenomena of this class are due to a further combination of the carbon with the iron as a result of local shocks in use, or maltreatment in manufacture. In filamentous or nodular materials like wrought-iron or other weld-metal, it comes from a disaggregation of the metal particles in their cinder envelopes, and a somewhat similar effect is noticed in metals of the copper class. The reverse of fatigue is the refreshment of metals; which is the restoration of their original qualities to overstrained metals by rest or by heating. See CRYSTALLIZATION OF METALS.

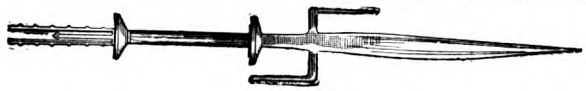
**Fatima,** b. 606. Daughter of Mahomet and Khadijah; m. 621 to Ali, who became Caliph 655.

**Fatimites.** Arabian dynasty claiming descent from Fatima, ruling 909–1171 over Egypt and N. Africa, and latterly over Syria and Palestine.

**Fatty Degeneration.** Conversion of any tissue into fat; to be distinguished from obesity, which is a deposit of fat in the tissues, the structure of which remains the same.

**Fauces.** The throat; in a more restricted sense, the opening bounded by the tonsils and hard and soft palates.

**Fauchard.** Species of hand-bill, originally scythe-shaped



Fauchard.

and borne by peasants on feudal service. It gradually became convex on the cutting edge and spiked.

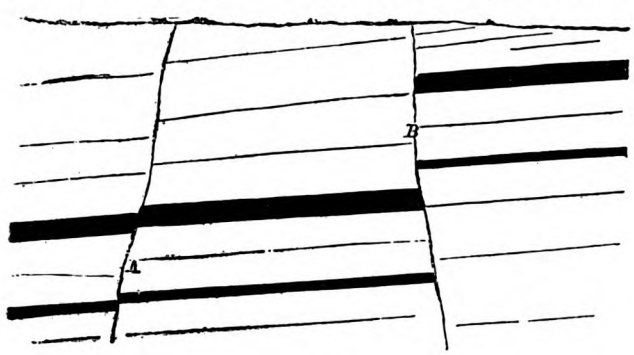
**Fauche,** HIPPOLYTE, 1797–1869. French Orientalist, tr. *Râmâyana*, 9 vols., 1854–58, and *Mahâbhârata*, 7 vols., 1863–67.

**Faucher,** LEON, 1803–1854. French economist, Deputy 1846–51; twice Minister of the Interior.

**Fauchet,** CLAUDE, 1530–1601. French historian.—Another of this name, 1745–1793, was preacher to Louis XVI., Bp. of Bayeux, and died on the scaffold.

**Faucit,** HELEN, b. 1820. English actress, who in 1851 became Mrs. (now Lady) Theodore Martin.

**Fault.** Any fissure accompanied by a displacement of the strata on either side. On one side the strata may be thrown down many fathoms, on the other thrown up; at the same




Fault.

time the dip may be altered. The inclination of the plane of displacement is called the Hade of the Fault. If this dips under the downthrow or the lower side the fault is normal; if under the upthrow or higher side it is reversed. See TROUBLE.

**Fauna.** Animals of any region or period, collectively.

**Fauntleroy,** HENRY, 1785–1824. English banker, hanged for forgery.

**Faunus.** Grandson of Saturn, protector of agriculture and of shepherds; giver of oracles; identified in later days with Arcadian Pan. He and the Fauns are represented as horned creatures, half men and half goats.

**Fauque de Jonquières,** JEAN PHILIPPE ERNEST DE, b. 1820. French Admiral 1874, Academician 1884; writer on mathematics.

**Faure,** FELIX FRANÇOIS, b. 1841. French Deputy from 1881; member of several cabinets; sixth Pres. of the Republic, Jan. 17, 1895.

**Fauriel,** CLAUDE CHARLES, 1772–1844. French historian and critic, Prof. in Paris 1830. *Southern Gaul*, 4 vols., 1836; *Provençal Poetry*, 3 vols., 1846.

**Fausse Braie.** Low rampart ab. 3 ft. high, formerly constructed to encircle the body of the work, in front of the curtain, to secure protection against breaching batteries. It was superseded in the time of Vauban by the tenaille.

**Faust.** One of the world-poems, generally thought Goethe's master-piece. Part I., 1805, is based on the Faust legend, pub. 1587, and previously dramatized by Marlowe and Calderon. Goethe's treatment of the theme differs essentially from that of these poets, being symbolical, while theirs is more or less literal. Part II., 1830, is generally deemed inferior to the first, though accomplished critics have given it nearly equal place.

**Faust,** JOHANN. See FUST.

**Faustin I.** "Emperor" of Haiti 1849–59. See SOULOUQUE.

**Faustina I.,** 104–141. Roman empress, wife of Antoninus Pius.—II., d. 175, her daughter, wife of Marcus Aurelius. Au-

Faustina I.

relius established a home for orphan girls, which was named Faustinian in honor of her.

**Faustina Bordoin,** ab.1693–ab.1783. Italian prima donna, wife of JOHANN ADOLPH HASSE (q.v.), one of Handel's singers in London, between whom and Cuzzoni rivalry became so bitter as to lead to public disturbances and scandals.

**Faust Recht.** See CLUB LAW.

**Favart,** CHARLES SIMON, 1710–1792. French dramatist. *Works*, 10 vols., 1810; *Mémoires*, 1809.

**Favella.** Sporocarps of the Red Algæ, in which the spores are inclosed by a jelly-like substance.

**Faveolate,** or FAVOSE. In Botany, reticulated, honeycombed structures.

**Favorinus,** 2d century. Roman orator and historical writer. Fragments of his Greek works remain.

**Favre,** ALPHONSE. Swiss geologist, prof. at Geneva. His publications on the Fan Structure of Mont Blanc first suggested the true formation of the Alps.

**Favre,** JULES CLAUDE GABRIEL, 1809–1880. French statesman and orator, Foreign Minister 1870–71.

**Favus.** Contagious disease of the skin, in which round or cup-shaped sulphur-colored crusts occur. It is common to man and animals, and is due to a vegetable parasite, *Achorion Schönleinii*.

**Fawcett,** EDGAR, b. 1847. American novelist and poet. *Purple and Fine Linen*, 1874; *The Buntling Ball*, 1884.

**Fawcett,** HENRY, 1833–1884. English political economist and statesman, blind from 1858; prof. Cambridge from 1863, M. P. 1865–74, Postmaster-gen. from 1880. *Political Economy*, 1862; *Economic Position of the British Laborer*, 1868; *Pauperism*, 1871; *Free Trade and Protection*, 1878.

**Fawcett,** JOHN, D.D., 1740–1817. English Baptist. Many of his hymns, 1782, are still in use.

**Fawcett,** JOSEPH, d. 1804. English poet. *Civilized War*, 1798; *War Elegies*, 1801.

**Fawkes,** GUY, 1570–1606. English conspirator, who with others undertook in 1605 to blow up the House of Parliament with king, lords, and commons, having placed 36 barrels of gunpowder in a vault under the House of Lords; arrested Nov. 5; executed Jan. 31, 1606.

**Fay,** ANDRÁS, 1786–1864. Hungarian poet, dramatist, and novelist. *Fables*, 1820, tr. 1877; *The Two Bathorys*, 1827; *House of the Beltekys*, 1832; *Dr. Javor*, 1855.

**Fay,** THEODORE SEDGWICK, b. 1807. Novelist and poet; U. S. Minister to Switzerland 1853–61; since resident in Berlin. *Norman Leslie*, 1835; *Hist. Germany*, 1888.

**Fayal.** One of the Azores islands, in the e. Atlantic. Area 69 sq. m.; pop. 25,145.

**Faye,** HERVÉ AUGUSTE ÉTIENNE, b. 1814. Discoverer of Faye's comet 1843; prof. Paris 1873; director Paris Observatory 1878.

**Faye's Theory.** As to the origin and movement of terrestrial storms. According to it they begin as whirls in the upper strata of the atmosphere, growing thence downward to the earth's surface and bringing the upper air down with them. This view was adopted by Andries.

**Fayrer,** SIR JOSEPH, M.D., LL.D., b. 1824. Anglo-Indian medical writer.

**Fayrfax,** ROBERT. English musician of 16th century.

**Fayum,** or FAYOUM. Most fertile province of Egypt, w. of the Nile, once connected with it by a canal; in a basin, part of which is 100 ft. below the river level. It contains a lake of

Ruins of the Labyrinth and Pyramids on the bank of the ancient Lake Moeris.

brackish water, Birket-el-Karn, ab. 35 m. long; also Lake Moeris, on the bank of which was the famous LABYRINTH (q.v.). Area 493 sq. m.; pop., 1882, 228,709.

**Fazy,** JEAN JAMES, 1796–1878. Founder *Revue de Geneve* 1834; head of the radical party which framed the Swiss constitution 1846, and was in power till 1861. *Hist. Geneva*, 1838–40; *Legislation*, 1874.

**Fealty.** Vassal's oath of fidelity to his lord; indispensable to every kind of common law tenure to land, except frank-almoigne.

**Fear,** CAPE. On s. coast of N. C.

**Fearne,** CHARLES, 1742–1794. English lawyer. *Contingent Remainders*, 1772.

**Feasts.** See FESTIVALS.

**Feather.** Tool used in rock-quarrying. See PLUG AND FEATHER.

**Feather Alum.** Mineral of fibrous texture and silky luster, essentially a hydrous aluminium and iron sulphate; also called Halotrichite.

**Featherfew.** *Chrysanthemum parthenium.* White-flowered herb of the Composite family, native of Europe, cultivated in gardens, and introduced as a weed into N. America. Properly called Feverfew.

Featherfew (*Chrysanthemum parthenium*).

**Featherfoil.** *Hottonia inflata.* Aquatic plant of the Primrose family, with inflated petioles and dissected leaves, native of s.e. U. S. Called also Water Violet.

**Feather Grass.** Certain grasses of the genus *Stipa*, natives of America, having long feathery awns to the glumes.

**Feathering Paddle-Wheels.** Form of water-wheel for side- or stern-wheel steamboats, in which the floats are pivoted to the radial arms instead of being rigidly bolted to them. The floats are so linked by rods to a center non-coincident with the center of the shaft that they are always vertical when immersed in the water. Hence there is more power in the engine available for propulsion, since it does not have to supply a component to lift the vessel before a float reaches the vertical through the shaft, nor to lift the water after that line is passed. Such wheels disturb the water much less than radial paddles, and make less wash and noise. The objection to them comes from regions where there is much difficulty from ice in severe winter weather.

**Feather Ore.** Variety of the mineral Jamesonite, found in the Hartz Mts.

**Feather River.** In Cal.; tributary of the Sacramento.

**Feathers.** In Asia and n. Africa from ancient times feathers have been employed in personal adornment, the ostrich, Indian roller, egret, ibis, and green kingfisher being most frequently employed. Those plucked from the living bird are more beautiful and durable than from the dead. The fashion spread to Europe with the Crusades, and in the 14th century knights began to wear enormous plumes on their helmets. During the next century they were a fashionable headdress among the upper classes and were jeweled along the stems. From then onward they never went out of general wear. England annually imports ab. 700 tons of goose feathers for beds alone. The consumption for millinery is enormous. The U. S. imported feathers and down for beds (1891) valued at $384,891.25; crude feathers, ostrich, $867,127, others $342,212; dressed feathers, ostrich, $8,089, others $508,995. See OSTRICH FARMING.

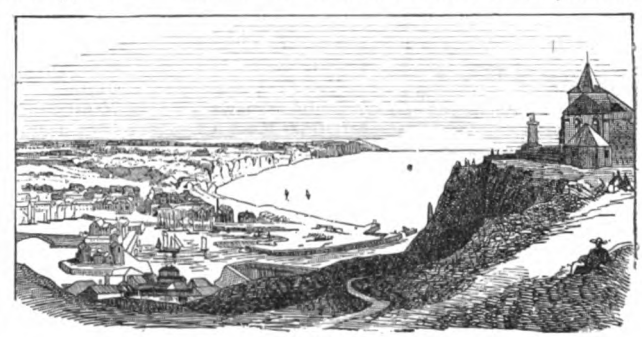
**Featherstonhaugh,** GEORGE WILLIAM, F.R.S., 1780–1866. English geologist, long in America. He gathered material for a geological map of the U. S., and pub. several works of travel.

**Febricula.** Any mild, non-contagious fever, such as that accompanying indigestion in children.

**Febrifuges.** Remedies or measures to lower the temperature in fever. In mild cases aconite, sweet spirit of niter, and cooling drinks, such as lemonade, are usually effectual; in more severe cases quinine or one of the coal-tar derivatives, such as antipyrine, phenacetine, etc., or cold affusions or baths. The coal-tar products are rather depressing, and quinine and cold water are the safest.

**February.** Second month in the year of Numa Pompilius 713 B.C. It was the month of purification in which the Lupercalia were held. Every leap-year it has 29 days by the addition of the intercalary day.

**Fécamp.** French seaport and manufacturing town in Normandy, 23 m. n. e. of Havre. It has a fine 14th century church,



Fécamp.

and its shipping is engaged in the North Sea and Baltic fishing and timber trade. Pop., 1891, 12,825.

**Fechner,** GUSTAV THEODOR. 1801–1887. Prof. Leipzig 1834–39; author of *Psychophysik*, 1860. His "Law" was based on observations made by Weber.

**Fechner's Law.** That the increase of the stimulus necessary to produce an increase of the sensation bears a constant ratio to the total stimulus; more exactly, that in order that the intensity of a sensation may increase in arithmetical progression, the stimulus must increase in a geometrical progression; or, as formulated by Fechner, the sensation increases as the logarithm of the stimulus. The principle is true only within certain limits, and does not hold with equal exactness for all the senses, its operation being more positive in the middle regions of sensibility, and in the fields of sight, hearing, pressure, and muscular sense, and becoming very uncertain as one approaches the upper and lower limits of sensibility. The interpretation of the law has given rise to much difference of opinion. Fechner regarded it as the fundamental formula of the relation between body and mind, but in this he has not been generally followed. The question whether it be a statement of psychological, physiological, or psycho-physiological relation has not yet been solved, the trend of opinion at the present day, however, being toward a physiological explanation.

**Fechter,** CHARLES ALBERT. 1824–1879. Actor of Franco-German parentage, b. in London, bred mainly in France, and settled in the U. S. 1872. His great emotional powers were shown especially in Hamlet, Othello, Ruy Blas, and Claude Melnotte.

**Feckenham,** JOHN DE (HOWMAN), ab. 1516–1585. Abbot of Westminster 1556; imprisoned from 1560, after refusing to become a Protestant and primate.

**Fecula.** Starch, or other granular substances.

**Fecundation.** Union of the spermatozoön with the ovum; allied to impregnation, which implies that the animal contains a fecundated ovum, and to fertilization, the essential union of two sexual protoplasms; *i.e.*, two cell-nuclei, derived from different sources. See POLAR GLOBULES. These nuclei are morphologically similar, and probably also physiologically equivalent. See SEX, SEXUAL REPRODUCTION, and CONJUGATION.

**Fecundity.** Power of producing many offspring. These may not all live, and thus the fertility of the species may not be equal to the fecundity of its individuals.

**Federal Government.** One in which political sovereignty is divided between the union and the states composing it, as in the U. S.

**Federalist.** Advocate of a federal government; in the U. S., the party which secured the adoption of the present Constitution 1789, and thereafter advocated a strong central government.

**Federalist.** Collection of 86 essays, advocating and explaining the U. S. Constitution, mainly pub. in New York *Journal*, 1787–88. Hamilton wrote most of them, Madison 29, and Jay 5.

**Fee.** Originally, land held on condition of rendering military service: then an estate of inheritance; if absolute, a fee simple; if subject to some qualification, restriction, or condition, a qualified or base, determinable or conditional fee.

**Feeder,** IN MINING. 1. Small vein of ore uniting with a larger vein. 2. Spring of water struck in the workings. 3. Blower of gas.

**Feeding,** PRINCIPLES OF. Though much careful scientific work has been done, little is absolutely known as to the best and most economical systems of feeding. The amount of nitrogen in the ration greatly influences both the amount and quality of production.

**Feed-Water Heater.** Apparatus for heating the water which is supplied to a steam-boiler before it enters the latter. The usual kind saves the heat of the exhaust steam from an engine by causing the feed-water to circulate on one side of tubes or a coil, on the other side of which is the exhaust steam. Steam, or water, may be inside the tubes, which are usually of brass on account of corrosion and their conductivity for heat. If water is inside the tubes, the solids deposited from scaling waters at or near 212° will precipitate inside the tubes and stop them up. In one form the exhaust steam is also a steam-jacket to the heater. Temperatures from 150° to 180° F. are usual.—The other type of heater is a coil of pipe in the flues which carry hot furnace gases to the chimney. This saves waste heat in boilers which part with their gases at high temperature. Its difficulties are unequal expansion and corrosion of the pipe, and deposit of flue-dust from the fuel. Scrapers have to be used for the exteriors of such pipes, which are best of cast iron, to resist sulphur in the gases. In applying heaters of the first type the loss from increased back pressure on the steam engine to force the steam through the heater must not be allowed to offset the gain from using hotter feed-water. The injector acts as a feed-heater, and there is some pre-heating of feed in the condensing engine. In many cases of the latter, however, a feed heater between the cylinder and condenser would be an economical addition.

Feed-Water Heater.

**Feeling.** Consciousness that the processes of the nervous system are in operation. Can be divided into the emotions and sensations, although by some the term is limited to pleasureable and painful bodily impressions; in a still more restricted meaning, the sense of touch.

**Fehmic Courts.** See VEHMGERICHTE.

**Feigned Disease.** Symptoms of various diseased conditions are often assumed to gain sympathy or avoid the duties of life. Paralysis, blindness, dumbness, deafness and epilepsy are most often assumed. Pustules resembling those of smallpox and ulcerations are sometimes produced by irritant substances. Detection is usually easy by observing the temperature, rate of breathing, and by catching the person off his guard. Insanity has been feigned to escape punishment for crime. Those who pretend to be affected with a disease are termed Malingerers.

**Feigned Issue.** Procedure to determine by verdict of a jury an incidental question of fact, to be made the foundation of an order or decree in another action; abolished in several States.

**Feijo,** DIOGO ANTONIO, 1784–1843. Brazilian liberal leader, Regent 1835–37.

**Feith,** RHIJNVIS, 1753–1824. Dutch poet, novelist, and dramatist. *Julia*, 1783; *Thirza*, 1784; *The Patriots*, 1785; *The Grave*, 1792; *Old Age*, 1802.

**Feitsui.** Hard pale green stone, highly prized in China. See JADE.

**Feldkirch.** Town of Austria, 20 m. s.w. of Bregenz. Here the French under Massena were defeated by Austrians May 22–23, 1799. Pop., 1890, 3,811.

**Feldmann,** LEOPOLD, 1802–1882. Bavarian Jew, author of many popular comedies.

**Feldspar.** Group of mineral silicates of aluminium, with varying proportions of sodium, potassium, and calcium. They are mostly light in color, plainly cleavable, and nearly as hard as quartz, but are not easily distinguished from each other. They are essential constituents in granite, gneiss, syenite, and many other well-known rocks. Common feldspar is known as orthoclase; other varieties are andesite, labradorite, oligoclase, albite, and microcline.

**Félibrige.** Society organized 1854 by Roumanille, Mistral, Aubanel, Brunet, Giera, Mathieu, and Tavan, for the study of the Provençal language and promotion of its literature, especially its poetry. The members are Felibres.

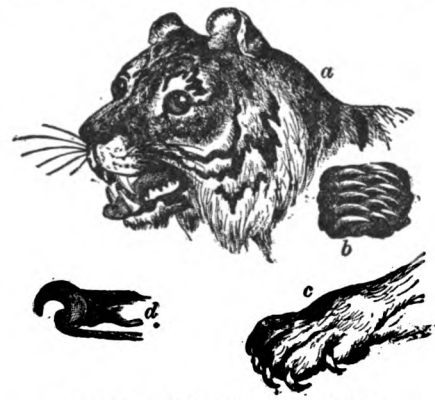
**Felice,** FORTUNATO BARTOLOMMEO DE, 1723–1789. Italian-Swiss author and translator; ed. *Encyclopédie*, 58 vols., 1770–1880.

**Felicific Actions.** Those, the tendency of which is to cause happiness, either to the agent or to society.

**Felicissimus.** Schismatic of Carthage ab. 251, opponent of Cyprian.

**Felicitas,** ST. Two martyrs of legend: 1. A widow at Rome, with seven sons, about 164. 2. A slave at Carthage, with Perpetua, about 205. Their days are July 10 and March 7.

**Felidæ.** Family of *Æluroidea*, including Cats; distinguished by having feet truly digitigrade, the soles hairy, claws retractile and curved. Jaws short, molars and præmolars $\frac{4}{3}$, tongue papillæ horny. Pupil of eye is a vertical slit, but expands to circular form in the dark so that they can see well at night. This family includes only one genus, *Felis*. See CATS, JAGUAR, LEOPARD, LYNX, LION, OUNCE, OCELOT, PANTHER, and TIGER.



Characteristic features of the Felidæ:

*a*, tiger's head; *b*, portion of tongue; *c*, right fore-paw, showing claws; *d*, claw, showing tendons. For dentition, see article CARNIVORA.

**Felix I.** Bp. of Rome 269–274.—II. 355–358, d. 365; expelled as an Arian, but canonized.—III. 483–492, he excommunicated Acacius of Constantinople.—IV. 526–530.—V. Amadeus VIII., Duke of Savoy, b. 1383, abdicated 1434, anti-pope 1440–49, d. 1451.

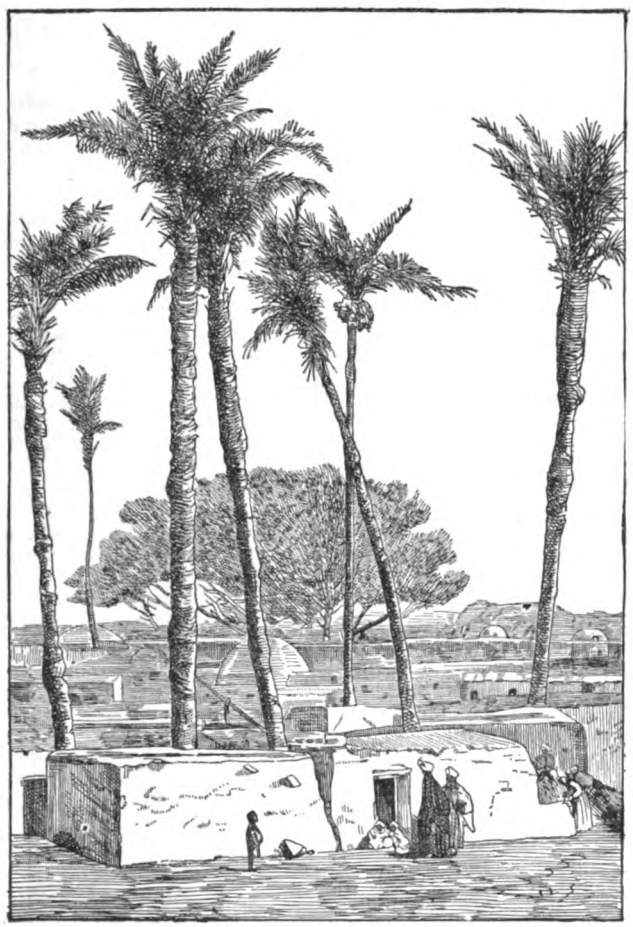
**Felix,** d. 818. Bp. of Urgel in Catalonia, father of the Adoptian heresy.

**Felix,** ANTONIUS. Procurator of Judæa 52–60, before whom St. Paul preached; a freedman, declared by Tacitus to have "used the power of a despot with the temper of a slave."

**Felix,** MARCUS MINUCIUS, 2d or 3d century. Christian apologist. His *Octavius* is of notably good style.

**Fell,** JOHN, D.D., ab. 1625–1686. Dean of Christ Ch. 1660, Bp. of Oxford 1676; subject of the verse, "I do not like thee, Dr. Fell."

**Fellahin.** Peasant descendants of the ancient Egyptians. They stand lowest in the social scale, use rude archaic tools,



Fellahin—Village Huts.

live in wretched huts, and have been oppressed for ages. Their condition has been improved under the British occupation.

**Fellatas,** or FULAS. African race of w. Soudan, zealous Mohammedans, widely scattered.

**Fellenberg,** PHILIP EMANUEL VON, 1771–1844. Swiss philanthropist, for a time associated with Pestalozzi; founder (1799) and head of a great school at Hofwyl, with departments of agriculture and art.

**Fellows,** SIR CHARLES, 1799–1860. English explorer in Asia Minor, knighted 1845. *Journal*, 1839–41; *Discoveries in Lycia*, 1841; *Xanthian Marbles*, 1843; *Coins of Ancient Lycia*, 1855.

**Fellow-Servants.** Persons in the service of a common master. For injuries sustained by one through the negligence of another, the master is not liable (except when made so by statute), unless the negligent act pertains to a duty owed by the master to the servant, such as providing suitable machinery, or, in some jurisdictions, unless the negligent servant has the right to control the injured one.

**Fellowship.** In Arithmetic, process of dividing gains or losses in a joint business enterprise in proportion to capital, time, or other conditions. Single fellowship involves but one condition, and requires only Simple Proportion. Compound fellowship introduces Compound Proportion.—In a college, foundation giving income and privileges to its holder.

**Fells.** Barren plains or hills in Scandinavia and n. England.

**Felo-de-se.** Crime of self-murder. In the case of a person of full age (14) and sound mind all goods and chattles were formerly forfeited to the Crown and the offender was buried at night at the meeting of four cross-roads with a stake through his body. In New York an attempt at suicide is punishable by imprisonment.

**Felon.** Inflammation, usually ending in suppuration of the structures of the finger. It may be limited to the surface, or involve the periosteum and bone and lead to wide destruction of tissues. Hot fomentations, wood ashes poultice, and incision down to the bone are usually the best treatment.

**Felony.** English common law divided all crimes into felonies and misdemeanors, according as their punishment might work a forfeiture of the criminal's lands or goods, or not. It is now generally defined by statute.

**Felsing,** JACOB, 1802–1875. German engraver.

**Felsite.** Rock consisting mainly of massive feldspar.

**Felspar.** See FELDSPAR.

**Felt.** Species of cloth formed by the matting of wool, hair, and fur of certain animals by the agency of heat, moisture, and pressure. Beautifully-ornamented felted cloths have been made in Persia and Turkestan from very ancient times.

**Felt,** JOSEPH BARLOW, LL.D., 1789–1869. Pres. New Eng. Hist. Soc. 1850–53. *Mass. Currency*, 1839; *Eccl. Hist. New England*, 1855–62.

**Feltham,** or **Felltham,** OWEN, 1608–1677. English author. *Resolves*, 1628.

**Felton,** CORNELIUS CONWAY, LL.D., 1807–1862. Prof. Harvard 1830, Pres. 1860; ed. Homer, 1833, and other classics. *Greece*, 1867.

**Felucca.** Small, two-masted boat with lateen-sails used in

Felucca.

the Mediterranean. It is also worked by from ten to sixteen oars and is excellently fitted for coast-trade.

**Femoral Artery.** See ARTERIES.

**Femur.** Bone of the thigh; longest and strongest of any in the human skeleton.

**Fence Law.** At common law, a land-owner was not bound to fence against animals: in the U. S. the rule is generally changed either by statute or by judicial decision, and the land-owner must construct and maintain such fences as statute, local ordinance, or custom requires. In most States, a legal fence must be 4 ft. high.

**Fencing.** The old sword play of Spain is responsible for modern fencing. The sport was carried by travelers into France, and the Spanish Bourbons, in conquering Sicily, carried thither and into Italy the rapier. Thus there are two schools, the Italian keeping more to the original long foil and bell guard and the French with its lighter weapon. Scientific fencing was an amusement of royalty in the 16th century and from Henry III. down to Louis XVI. was well preserved. After the fall of Napoleon and the return of the Bourbons there was a revival continuing well into the first half of this century. Its existence in U. S. was dependent upon individual interest, until the last ten years when the New York and the Boston Fencing Clubs were organized. Others followed, and in 1891 the Amateur Fencers' League of America was formed.

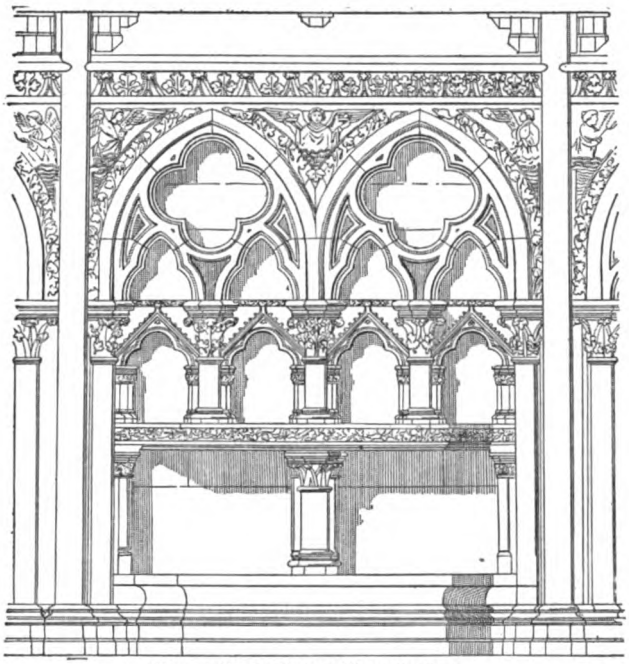
A fencing outfit consists of a foil, mask, glove, padded jacket and shoes. The rules of the American League provide for bouts of five touches, each touch counting one point. Some judges further add a half a point each for defense, attack and general good form. Disarmament does not count, but a touch immediately upon such disarmament does count. Contestants fence within a marked space, 20 ft. long by 3 ft. wide.

**Fénelon,** FRANÇOIS DE SALIGNAC DE LA MOTHE, 1651–1715. Tutor of Louis XIV.'s grandsons 1689. Academician 1693, Abp. of Cambray 1695. His defense of Mme. Guyon, *Maxims of the Saints*, 1697, brought him into trouble, and his famous *Telemachus*, 1699, caused his banishment from court. His *Spiritual Letters*, *Dialogues*, and other works are well-known in English versions. His memory has been much cherished by Protestants, though he was a persecutor 1685–86.

**Fenestella.** Foliaceous polyzoan, abundant in some of the Paleozoic Strata.

**Fenestella,** ab. 52 B.C.–19. Latin historian, cited by Plutarch and others. His *Annales* survive only in fragments.

**Fenestella.** In Architecture, a niche cut in the thickness of the wall, generally on the south side of the altar, containing the piscina (sometimes two or three), and frequently the credence-table above. It is not uncommon to find it on the north



Fenestella, La Sainte Chapelle, Paris.

side in Normandy, the situation of the altar making this more convenient. It was not known in England before the 12th century; the form and decoration vary but the character of the architectural features will always indicate the date.

**Fenestra.** See EAR.

**Fenestral.** Window-like opening closed with paper or cloth instead of glass.

**Fenestration.** In Architecture, disposition and treatment of openings in wall-surfaces, including doorways as well as windows.

**Fenestrate,** or FENESTRATED. Organs with coarse reticulations, or marked with transparent areas separated by bars like window panes.

**Fenestrated Membrane** OF SPONGES. See CHOANOCYTES.

**Fenians.** Association of Irish and Irish-Americans with the purpose of overthrowing English rule in Ireland and establishing a republic. It had its origin in America among those who had emigrated on account of arbitrary eviction or inability to pay rent, and who smarted under a sense of injustice. The organization was secret, compact, thoroughly organized. The leaders were arrested, the leading organs suppressed, and troops sent into Ireland to preseve quiet. The escape of one of the leaders and his return to America renewed the agitation, and in 1866 a raid was made into Canada, which proved a failure. In 1867 insurrections were attempted in England and Ireland, but with no success. The recent movements have been peaceable, in the way of efforts for home-rule.

**Fenn,** GEORGE MANVILLE, b. 1831. English novelist, journalist, and writer of juvenile books. *Mad*, 1868; *Menhardoc*, 1884; *Bag of Diamonds*, 1887.

**Fennel.** Herb of the Carrot family, cultivated in gardens for its aromatic leaves; native of Europe, sparingly introduced into the U. S.

**Fennel-flower.** *Nigella sativa.* Showy-flowered herb of the natural family *Ranunculaceæ*, cultivated in gardens; native of the Mediterranean region.

**Fenton,** EDWARD, d. 1603. English navigator who led an expedition in search of the n. w. passage 1582–83.

**Fenton,** ELIJAH, 1683–1730. English poet. He tr. 4 books of Pope's *Odyssey*.

**Fenton,** REUBEN EATON, 1819–1885. M. C. 1857–65; Gov. of N. Y. 1865–69; U. S. Senator 1869–75.

**Fenugreek.** *Trigonella Fœnum-Græcum.* Low herb of the natural family *Leguminosæ*, native of the Mediterranean region.

**Fenwick,** JOHN, 1618–1683. Founder of Salem, N. J.; imprisoned by Sir E. Andros 1678–80.

**Fenwick,** SIR JOHN, 1645–1697. English Jacobite, attainted and beheaded for conspiracy.

**Feoffment.** Conveyance of land by delivery of its possession from the grantor to the grantee; obsolete.

**Feræ.** Carnivora. See FISSIPEDIA.

**Feræ Naturæ.** Naturally wild animals, as distinguished from the domestic. One can have only a qualified property in them; *i.e.*, he is owner so long only as he has control of them. He is bound at his peril to keep them from doing mischief.

**Ferdausi,** or FERDOSSE. See FIRDAUSI.

**Fer-de-Lance.** *Craspedocephalus lanceolatus.* Yellow and extremely venomous W. Indian viper. It is ab. 9 ft. long, springs a considerable distance without warning, and is greatly dreaded by man and beast.

**Ferdinand I.,** 1503–1564. German Emperor 1556; King of Hungary and Bohemia 1527; King of Rome 1531; brother and successor of Charles V. The Pope refusing consent to his election, the electors dispensed with that consent thereafter.

**Ferdinand II.,** 1578–1637. Emperor of Germany 1619; nephew of Maximilian II. He devoted his life to suppression of Protestantism, and first crushed the liberties of Bohemia. The conflict thus begun spread over Germany, became the Thirty Years' War, and caused general misery and desolation.

**Ferdinand III.,** 1608–1657. German Emperor 1637. Son and successor of Ferdinand II.; King of Hungary 1625, and Bohemia 1627. The war ended 1648. The diet of Nuremberg, 1653–54, was the last presided over by an emperor in person. See WESTPHALIA, PEACE OF.

**Ferdinand I.,** "THE GREAT," d. 1065. King of Castile 1035, and Leon 1038. He attacked Portugal, Navarre, and the Moors, greatly increasing his dominions.

**Ferdinand III.,** 1199–1252. King of Castile 1217, and Leon 1220. He gained sundry victories over the Moors, and was canonized 1671.

**Ferdinand V.,** "THE CATHOLIC," 1452–1516. King of Castile 1474, in right of his wife Isabella, and of Aragon 1479. He established the Inquisition 1480, conquered Granada 1492, ex-

Ferdinand, the Catholic.

pelled the Jews, sent out Vespucci 1497, conquered Naples 1500, and Navarre 1512, thus founding the great Spanish Monarchy. See ISABELLA.

**Ferdinand VI.,** 1712–1759. King of Spain 1746, succeeding his father Philip V.

**Ferdinand VII.,** 1784–1833. King of Spain 1808; deposed by Napoleon; restored 1814. He annuled the constitution 1816, and re-established the Pragmatic Sanction 1830.

**Ferdinand I.,** 1345–1383. King of Portugal 1367. He waged an unsuccessful war with Castile.

**Ferdinand,** "THE JUST," 1379–1416. King of Aragon 1412.

**Ferdinand I.,** 1423–1494. King of Naples 1458.

**Ferdinand I.** (or IV.), 1751–1825. King of Naples 1759; expelled by the French 1799 and 1805; restored by England and Austria 1799 and 1815. He was a cruel tyrant, as was his grandson, FERDINAND II., "BOMBA," 1810–1859, king from 1830.

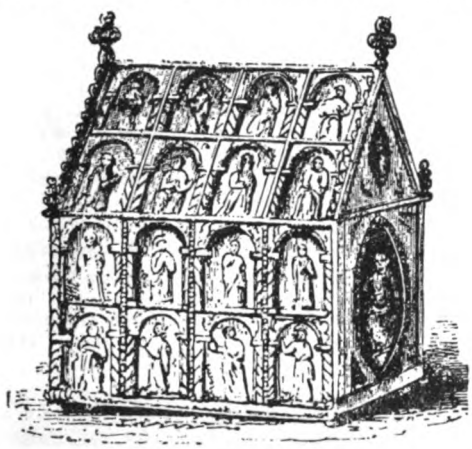
**Ferdinand III.,** 1769–1824. Grandduke of Tuscany 1790; Archduke of Austria; son of Leopold II., German Emperor; expelled by the French 1799; deposed 1801; restored 1814.

**Ferdinand I.,** 1793–1875. Emperor of Austria 1835; son of Francis I.; abdicated 1848.

**Ferdinand,** b. 1861. Prince of Bulgaria 1888; grandson of Louis Philippe, son of the Prince of Saxe-Coburg.

**Fere Champenoise.** In n.e. France; scene of a French defeat March 25, 1814.

**Feretory.** Shrine of gold, silver, wood, or ivory, containing the relics of saints, either fixed on tombs or borne in religious processions. Its form is usually that of a chest with a high pitched roof.



Feretory in Ely Cathedral.

**Ferguson,** ADAM, LL.D., 1723–1816. Prof. Edinburgh 1759–85. *Civil Society*, 1766; *Moral Philosophy*, 1772; *Moral and Political Science*, 1792. His *Hist. Roman Republic*, 1782, was highly valued.

**Ferguson,** JAMES, F.R.S., 1710–1776. Scottish peasant, who became the first astronomer and mechanician in England, though wholly self-taught; lecturer from 1748; pensioned 1761. *Astronomy*, 1756; *Mechanics, Hydrostatics, Pneumatics, and Optics*, 1760.

**Ferguson,** JAMES, 1797–1867. Scottish-American civil engineer and astronomer, in U. S. Naval Observatory from 1847; discover of three asteroids 1854–60.

**Ferguson,** PATRICK, 1744–1780. Scottish officer, inventor of the breech-loading rifle, patented 1776; killed at King's Mountain, S. C. He spared Washington's life at the Brandywine 1777.

**Ferguson,** ROBERT, ab. 1637–1714. Scottish intriguer; inspirer and chaplain of Monmouth's rebellion, 1685; later a Jacobite. *Hist. Revolution*, 1706.

**Ferguson,** SIR SAMUEL, 1810–1886. Irish poet and antiquarian; knighted 1878.

**Fergusonite.** Rare mineral, first found in Greenland, containing the chemical elements niobium, tantalum, yttrium, erbium, and cerium.

**Fergusson,** JAMES, D.C.L., F.R.S., 1808–1886. Scottish archæologist, long in India. His *History of Architecture*, 4 vols., 1865–76, is the leading English work on that subject. *Rock-cut Temples*, 1845; *Fortification by Earthworks*, 1849; *Palaces of Nineveh and Persepolis*, 1851; *Tree and Serpent Worship*, 1869; *Rude Stone Monuments*, 1872.

**Fergusson,** ROBERT, 1750–1774. Scottish poet.

**Fergusson,** SIR WILLIAM, M.D., F.R.S., 1808–1877. Scottish surgeon; prof. King's Coll., London, 1840; Baronet 1866. *System of Practical Surgery*, 1842; *Progress of Anatomy and Surgery*, 1867.

**Feriæ.** Roman holidays, of which some pertained to families. Of the public ones, some were fixed, others movable or occasional, and had to be announced by the Consul or Prætor.

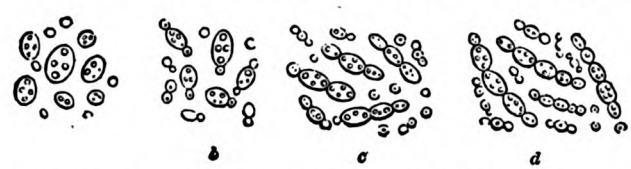
**Feringhis.** Eurasians of Portuguese descent in Bengal; also Europeans, so called by Asiatics.

**Ferishtah,** or **Firishta,** MOHAMMAD KASIM HINDU SHAH, d. ab. 1613. Historian of the Mohammedan power in India. His *Tarikh*, edited at Bombay 1831 and tr. 1832, is a valuable work.

**Fermat,** PIERRE DE, 1601–1665. French mathematician. With Pascal he founded the mathematical treatment of the Theory of Probabilities. *Varia Opera Mathematica*, 1679; repub. in facsimile 1861.

**Fermat's Law.** If a ray of light or other form of wave-motion pass from a point A in one medium to a point B in another, there is no path between A and B, taking into account the relative velocities of propagation in the two media, so short in time as that traversed according to the law that the ratio of the sine of the incident angle to that of the angle of refraction is constant. This constant, which in optics is the index of refraction, is the ratio of the actual velocities in the two media.

**Ferment.** Organic body or mass of bodies that can produce chemical decomposition in substances with which they come into contact. There are two sorts, enzymes and organized ferments. The former are minute particles of ultra microscopic size, produced originally within living cells. They cause chemical changes without being themselves altered in bulk or constitution. Examples are ptyalin, pepsin, rennet, trypsin. The organized ferments are the bacteria, yeasts and moulds. To some extent any protoplasmic cell is a ferment by virtue of the enzymes it contains. Organized ferments not only change the constitution of the substances they act on but undergo the changes involved in assimilation and disassimilation, called Growth. Increase in cell bulk ultimately causes cell-division (cell reproduction) and a multiplication of the microscopic particles composing the ferment. Such a result is seen in the brewer's vat, on whose surface or bottom there collects a considerable quantity of yeast, all derived from the small amount added to the malt or sweetwort. Yeasts and moulds as a rule produce alcohol as a by-product of fermentation, while bacteria produce toxic substances called Ptomains, which have numerous specific properties that can affect the nerve cells of an animal. See FERMENTATION, DISEASE GERMS, and SACCHAROMYCETES.




*Saccharomyces cerevisiæ*, or Yeast-plant, as developed during the process of fermentation:

*a, b, c, d*, successive stages of cell-multiplication.

**Fermentation.** All chemical decomposition produced by Ferments. The evolution of bubbles of gas, as of $CO_2$ in the action of yeast in a sugar-solution, while affecting the sense of sight as the main action, is accompanied by formation of the toxic substance, alcohol, in the solution. The sugar gradually disappears, being converted mainly into these two decomposition products; a very small part is assimilated by the yeast in its growth, and some is used in the formation of glycerine, succinic acid, etc., which also are produced in minute amounts. Putrefaction is an analogous process, produced by bacteria in nitrogenous substances, accompanied by production of ammoniacal and sulphureted gases, and a toxine or ptomain. The ENZYMES (q.v.), changing starch to sugar, proteid to peptone, fat to glycerine and fatty acid, exhibit the simplest forms of fermentation. It is by means of various enzymes produced by protoplasm that the latter wields its assimilative power. The action of bacteria and yeasts is merely such an exhibition.

**Fern.** Plant of the order *Filices*.

**Fern,** CINNAMON. *Osmunda cinnamomea*. Large fern growing in swamps and bogs throughout e. N. America.

**Fern,** CLIMBING. Ferns of the genus *Lygodium*, which climb over bushes by their twining leaf-stalks; plants of wide geographical distribution.

**Fern,** FANNY. See PARTON.

**Fern,** FLOWERING. *Osmunda regalis*. Marsh fern, native throughout the n. hemisphere.

**Fern,** OSTRICH. *Onoclea struthiopteris.* Large, handsome fern, its spore-bearing leaves rolled up and bearing some resemblance to ostrich plumes; native of the n. temperate zone.

Ostrich Fern.

**Fern,** SENSITIVE. *Onoclea sensibilis.* Common N. American fern, growing in low grounds, its leaves erroneously supposed by the older botanists to be sensitive.

**Fern,** SWEET. *Comptonia peregrina.* Low, aromatic shrub of the Bayberry family, with pinnatifid leaves; native of e. N. America.

**Fernandez de Castro,** MANUEL, b. 1825. Spanish geologist and engineer, prof. Madrid 1869.

**Fernandez de Cordova,** DIEGO, MARQUIS OF GUADALCAZAR. Viceroy of Mexico 1612–21, and of Peru 1622–29.

**Fernandez de la Cueva,** FRANCISCO, DUKE OF ALBUQUERQUE, b. ab. 1610. Viceroy of Mexico 1653–61.—His grandson, FRANCISCO, held the same post 1702–11.

**Fernandez de Palencia,** ab. 1520–1581. Historian of Peru 1571.

**Fernandez Madrid,** JOSÉ, 1789–1830. Pres. of New Granada 1816; Minister to England 1825; author of poems, tragedies, and medical books.

**Fernando do Noronha.** Volcanic island in s. Atlantic, lat. 3° 50′ S., long. 32° 25′ W.; convict station of Brazil; discovered 1503. Area 7 sq. m.; pop. ab. 2,000.

**Fernando Po.** Island in Gulf of Guinea, lat. 3° 12′ N., long. 3° 48′ E.; discovered 1471; now a Spanish convict station. Its mountains are over 10,000 ft. high. Area 670 sq. m.; pop. ab. 20,000, chiefly negroes of low grade.

**Ferney.** French village near Geneva; Voltaire's home 1758–78. Pop., 1891, 1,104.

**Fernow,** BERNHARD EDWARD, b. 1851. German-American forester, in U. S. Dept. of Agriculture since 1886.

**Ferrand,** COUNT, OF PORTUGAL. See JOHANNA OF CONSTANTINOPLE.

**Ferrand,** MARIE LOUISE, COUNT OF, 1753–1808. French general, who served in America and in Santo Domingo 1802–8.

**Ferrar,** NICHOLAS, 1592–1637. English founder of a religious community at Little Gidding, 1625–47, celebrated in John Inglesant.

**Ferrara.** City of n.e. Italy, long prominent and populous. Its university, founded 1264, closed 1794–1824, has a fine library.

Castle at Ferrara.

Its school of painting was dependent on that of Padua. It has an important Gothic cathedral and an old castle or fortress. Pop., 1891, 28,814.

**Ferrara,** ANDREA, 16th century. Italian armorer, noted for his broadswords.

**Ferrara-Florence,** COUNCIL OF, 1438–39. It arranged a temporary and nominal union of the Greeks with Rome, abrogated 1472.

**Ferrari,** GAUDENZIO, 1484–1549. Italian painter. Many of his works are at or near Milan; his *Passion* is at Varallo in Piedmont.

**Ferrari,** GIUSEPPE, 1811–1876. Prof. at Turin, Milan, and Florence. *Hist. of Italian Revolutions*, 4 vols., 1856–58.

**Ferrari,** PAOLO, 1822–1889. Italian dramatist, prof. at Modena and Milan. *Goldoni*, 1852; *Parini*, 1857.

**Ferrates.** Salts derived from ferric acid, $H_2FeO_4$, by replacing the hydrogen with metals.

**Ferreira,** ANTONIO, 1528–1569. Portuguese lyric, pastoral, and dramatic poet.

**Ferrel,** WILLIAM. 1817–1891. Assistant in Tidal Division, U. S. Coast and Geodetic Survey 1867; prof. of meteorology in U. S. Signal Office 1882–86; author of *Motions of Solids and Fluids on the Earth's Surface*, 1859; *Tidal Researches*, 1874; *Meteorological Researches*, 1875–81; *Recent Advances in Meteorology*, 1883; *Treatise on the Winds.* He was the founder of modern dynamic meteorology.

**Ferrel's Law.** Principle first applied 1856 to meteorology, in accordance with which any body moving in any direction on the earth's surface is deflected to the right (or left) in the n. (or s.) hemisphere by an amount that varies directly as the velocity of the body and as the sine of the latitude. On this principle Ferrel based the accepted mathematical theory of the general circulation of the atmosphere and ocean and the rotation of storms. The deflection due to the earth's rotation had been specifically proven by Poisson 1827, but its profound importance in meteorology was first recognized and developed by Ferrel.

**Ferrer,** RAFAEL, 1570–1611. Spanish Jesuit, missionary and explorer in Peru from 1593.

**Ferrers,** LAWRENCE SHIRLEY, 4th EARL, 1720–1760. Tried by the lords and hanged for murdering his steward.

**Ferrets.** See MUSTELIDÆ. The European Ferret, Pole-cat, Fitch, or Foul Mart is ab. 16 in. long, and in color black-brown. It preys on small animals, attacking them in the neck, or piercing their brain, and is destructive to poultry. The African

Ferret (*Putorius furo*).

Ferret is an albino, domesticated in different countries for catching rabbits and rats, but it endures cold weather poorly. In America is the Blackfooted Ferret or Polecat, which lives on the gophers and prairie-dogs of the West.

**Ferric Acid.** $H_2FeO_4$. This acid itself is unknown, but metallic salts have been made. They are unstable.

**Ferric Chloride.** $FeCl_3$. Yellowish-brown solid, which can be obtained in crystals containing six or twelve molecules of water; made by dissolving iron in hydrochloric acid and passing chlorine into the solution, or by merely allowing a solution of ferrous chloride to stand exposed to the air. It is used in medicine.

**Ferric Ferrocyanide,** or PRUSSIAN BLUE. $Fe_4[Fe(CN)_6]_3$ or $Fe_7(CN)_{18}$. Discovered early in 18th century. On the large scale it is made by precipitating ferrous sulphate with potassium ferrocyanide and then treating the product with chlorine water or dilute nitric acid. Dissolved in ammonium tartrate it gives a deep violet color, with oxalic acid a blue color; used as a pigment.

**Ferric Hydroxide.** $Fe(OH)_3$. Reddish-brown precipitate, formed by adding ammonium hydroxide to a ferric salt

solution. Heated to 100° it loses water, forming a compound of the formula FeO.OH, and other basic hydroxides.

**Ferric Hydroxide,** SOLUBLE. Red liquid, used in medicine; made by treating freshly precipitated ferric hydroxide with a solution of ferric chloride and then dialyzing the solution thus formed.

**Ferric Nitrate.** $Fe(NO_3)_3+12H_2O$. Very deliquescent; made by dissolving iron in nitric acid; used as a mordant in dyeing and calico printing.

**Ferric Oxide,** or IRON SESQUIOXIDE. $Fe_2O_3$. Found native as HEMATITE (q.v.); brownish red powder, made by heating ferric hydroxide. The rouge used for polishing purposes is ferric oxide made from heating ferrous sulphate. A finer variety is obtained from ferrous oxalate.

**Ferric Phosphate.** $FePO_4$. White powder, insoluble in water; made by treating a ferric salt with sodium phosphate.

**Ferric Sulphate.** $Fe_2(SO_4)_3$. White mass which dissolves in water, with a brownish red color; made by dissolving ferric oxide in sulphuric acid.

**Ferric Sulphide.** $Fe_2S_3$. Made by heating iron and sulphur together. $FeS_2$ is also called ferric sulphide. See IRON PYRITES.

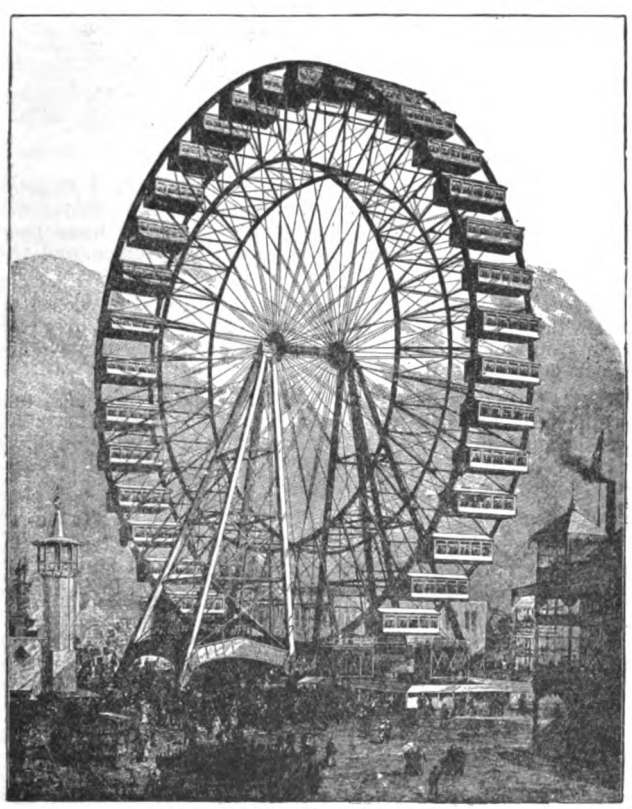
**Ferricyanides.** Salts of hydroferricyanic acid, $H_3Fe(CN)_6$. The most important one is POTASSIUM FERRICYANIDE (q.v.).

**Ferrier,** DAVID, M.D., LL.D., F.R.S., b. 1843 at Aberdeen. Prof. King's Coll., London, 1872–89. *Functions of the Brain*, 1876; *Cerebral Disease*, 1878.

**Ferrier,** JAMES FREDERICK, 1808–1864. Prof. Edinburgh 1842 and St. Andrew's from 1845. *Metaphysics*, 1854; *Greek Philosophy*, 1866.—His aunt, SUSAN EDMONSTON, 1782–1854, won much repute by three novels: *Marriage*, 1818; *The Inheritance*, 1824; and *Destiny*, 1831.

**Ferrier,** JOSEPH MARIE AUGUSTIN GABRIEL, b. 1847. French painter.

**Ferris Wheel.** Designed by G. W. G. Ferris, and erected 1893 at the Exposition in Chicago to carry passengers in cars hung around the circumference. It was 250 ft. in diameter, 28½ ft. wide; its total weight including standards was 4,300



Ferris Wheel.

tons, and its cost ab. $300,000. It was supported on a hollow steel shaft 32 in. in diameter, 16 in. opening and 43 ft. long, turned by steam power. There were 36 passenger cars, having a total capacity of 2,160 persons. During the Exposition 1,453,611 passengers were carried at 50 cents each.

**Ferrite.** Undetermined brownish or reddish product of alteration, sometimes seen in sections of rocks studied under the microscope; name proposed by Vogelsang.

**Ferrocyanides.** Salts of hydroferrocyanic acid, $H_4Fe(CN)_6$. The most important one is POTASSIUM FERROCYANIDE (q.v.).

**Ferrol.** Seaport on n. coast of Galicia, Spain, with one of the finest harbors in Europe. Pop., 1887, 25,701.

**Ferroso-Ferric Oxide.** Magnetic oxide of iron, $Fe_3O_4$., formed when iron is burned in oxygen, or when steam is passed over highly heated iron. It occurs in nature as MAGNETITE (q.v.).

**Ferrotype,** or TINTYPE. Japanned sheet-iron plate is coated with collodion, sensitized with bromide of cadmium and iodide of potassium, and then placed in the silver nitrate bath. It is exposed in the camera one-half the time as for a negative, developed with sulphate of iron, fixed with potassium cyanide and varnished.

**Ferrous Ammonium Sulphate.** $FeSO_4.(NH_4)_2SO_4+6H_2O$. Hard greenish-blue crystals, obtained by dissolving the proper quantities of ferrous and ammonium sulphates in hot water and allowing them to crystallize.

**Ferrous Chloride.** $FeCl_2+4H_2O$. Made by dissolving iron in hydrochloric acid without access of air. Oxidizing agents convert it into ferric chloride.

**Ferrous Ferricyanide,** or TURNBULL'S BLUE. $Fe_5(CN)_{12}$. When dry, a blue powder, with a copper red luster; made by precipitating potassium ferricyanide with ferrous sulphate; used as a pigment.

**Ferrous Hydroxide.** $Fe(OH)_2$. When pure, it is a white solid, but when obtained by precipitating a soluble ferrous salt with an alkali it is usually a dirty green, which rapidly changes to brown or red, owing to the oxidation of the compound to ferric hydroxide. When heated it is converted into ferric oxide.

**Ferrous Iodide.** $FeI_2+4H_2O$. Made by heating iron filings and iodine.

**Ferrous Oxide.** FeO. Black powder made by passing hydrogen over heated ferric oxide.

**Ferrous Phosphate.** $Fe_3(PO_4)_2+8H_2O$. Colorless crystals when pure; made by treating ferrous sulphate with sodium phosphate; used in medicine. See VIVIANITE.

**Ferrous Sulphate,** GREEN VITRIOL, or COPPERAS. $FeSO_4+7H_2O$. Green efflorescent monoclinic prisms, made by dissolving iron in dilute sulphuric acid; used as a disinfectant, a source for Nordhausen sulphuric acid, for the manufacture of inks, and in dyeing.

**Ferrous Sulphide.** FeS. Made by heating iron filings and sulphur together; used as a source for hydrogen sulphide.

**Ferrule.** Short, brass tube of a standard size, used for connecting a service pipe to a street main.

**Ferry,** JULES FRANÇOIS CAMILLE, 1832–1893. French Minis-

Jules Ferry.

ter of Public Instruction 1879; Prime Minister 1880–81 and 1883–84; Senator 1891.

**Ferry,** ORRIS SANFORD, 1823–1875. M. C. from Conn. 1859–61; U. S. Senator from 1867.

**Ferry,** PAUL, 1591–1669. Huguenot pastor at Metz, noted for eloquence and efforts toward Christian reunion.

**Ferry,** THOMAS WHITE, b. 1827. M. C. from Mich. 1865–71; U. S. Senator 1871–83; acting Vice-Pres. Nov. 1875–March 1877.

**Ferrybridge.** In Yorkshire; scene of defeat of Yorkists, March 1461, by Lord Clifford, who was slain in attempting to rejoin the main body of the Lancastrians at Towton.

**Fertility.** See FECUNDITY.

**Fertilization.** Processes by which the male protoplasm is brought into proximity to the female; also called FECUNDATION (q.v.).

**Fertilizer.** Any material that adds available plant food to the soil. While plants feed on a large number of substances, it has been found by experiment that there are but three, phosphoric acid, potash, and nitrogen, in which most soils are ever deficient; so a fertilizer is a substance containing some or all of these substances. See MANURE.

**Fescennine Games.** Named from a town in s. Etruria; ancient country festivals, enlivened by improvised jests, often stinging and indecent, and rude verses, mirth-provoking and satirical. These songs were mostly restricted to weddings, and were long popular at Rome.

**Fesch,** JOSEPH, 1763–1839. Half-uncle of Napoleon I., Abp. of Lyons 1802, Cardinal 1803. He retired to Rome 1814.

**Fescue Grass.** Grasses of the genus *Festuca*, important as pasture and meadow grasses; of wide geographical distribution.

*Festuca elatior.*

**Fessenden,** THOMAS GREEN, 1771–1837. New England poet and journalist. *Terrible Tractoration*, 1803.

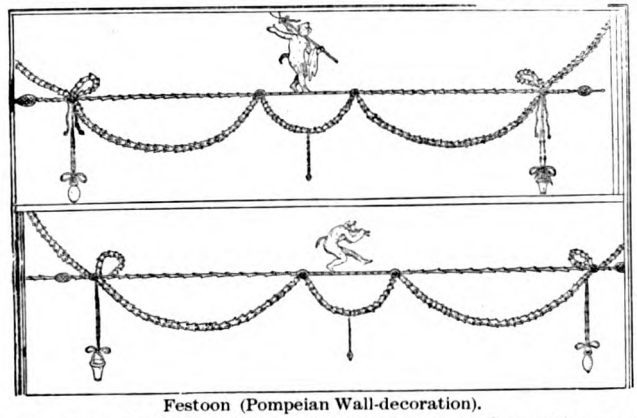
**Fessenden,** WILLIAM PITT, LL.D., 1806–1869. M. C. from Me. 1841–43; U. S. Senator 1854–64. As Sec. Treasury 1864–65 he issued the 7.3 per cent loan. Again in the Senate (from March 1865) he opposed the impeachment of Pres. Johnson.

**Fessler,** IGNAZ AURELIUS, 1756–1839. German author of Hungarian birth; prof. and pastor in Russia from 1809. *Marc Aurel*, 1790; *Matthias Corvinus*, 1793; *Attila*, 1794; *Hist. Hungarians*, 10 vols., 1812–25; *Recollections*, 1826.

**Festivals,** or FEASTS. Among the Jews, the seventh day and year, Passover, Feast of Tabernacles, of Trumpets, Day of Atonement, and later, Purim and Dedication of Temple. With Christians the chief are Christmas, Easter, Ascension, and Pentecost.

**Festivals,** MUSICAL. The most important which have a permanent organization in Germany is the Lower Rhenish festival, dates back to 1811, and given annually at Düsseldorf, Aix-la-Chapelle, or Cologne. In England the Three Choirs Festival, held alternately each year at Gloucester, Worcester, and Hereford, dates from 1724. Every third year important festivals are also held at Birmingham, Norwich, Leeds, and Bristol. The Handel Festival in the Crystal Palace, Sydenham, at which the greatest choral and instrumental masses are piled up, began 1857. In the U. S., festivals occur every year at Worcester, Mass., and every second year at Cincinnati. There are a number of smaller annual festivals, merely local in their interest and influence. The Cincinnati festivals began 1873, and have always been directed by THEODORE THOMAS (q.v.). The Worcester festivals, of which the thirty-eighth took place 1895, grew out of the musical conventions common in New England. The German singing clubs for men's voices have given festivals intermittently in the larger cities since 1849, when the first Sängerfest took place in Cincinnati.

**Festoon.** Garland or wreath usually composed of flowers, fruits, etc., when carved, bound together and suspended by the ends. In painting it is usefully employed in decoration, and was freely used in Pompeian wall-decoration.

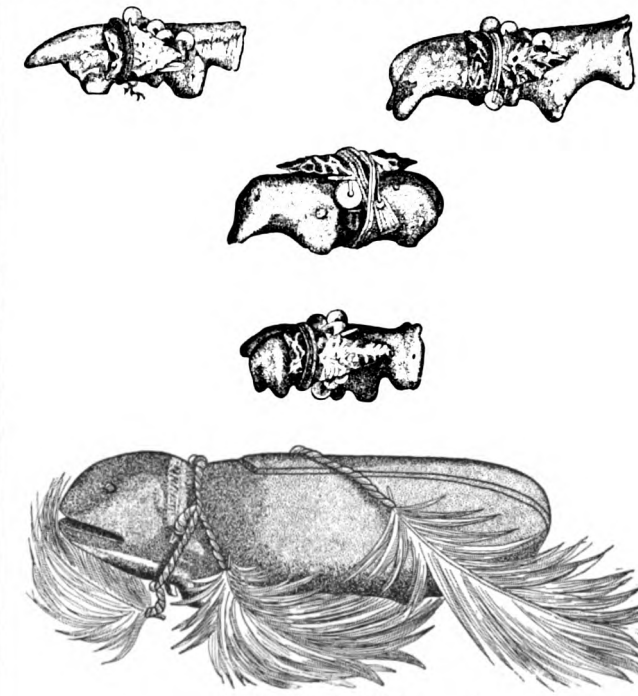

Festoon (Pompeian Wall-decoration).

**Festus,** PORCIUS. Successor of Felix as procurator of Judæa, 60–62; of higher character, and more friendly to St. Paul.

**Festus,** SEXTUS POMPEIUS. Latin grammarian of 2d century or later, known only by his abridgment of Verrius Flaccus' *De Verborum Significatione*. Half of this important work survives in a mutilated state.

**Fetiales.** College of Roman priests who presided over all international declarations, whether demanding satisfaction for public wrongs, declaring war, or ratifying peace. They alone knew the formal words which the religious laws of Rome made necessary on such occasions.

**Fetich,** or FETISH. Object, as stone, snake, or tree, in which a spirit is believed to reside. Its possessor, whether person, family, or tribe, has a certain control over this spirit and can require its services. On the west coast of Africa horns of animals are the commonest fetiches. The Indians of America venerate a great variety of objects, among which worked stones are especially esteemed. A preference seems to have been given to stone of a green color, especially in Mexico, and the s.w. U. S.


Zuni Prey-God Fetiches.

**Fetichism.** Worship of inanimate objects, supposed to possess talismanic virtue; lowest form of religion, vaguely conceiving a divine spirit in all things, and selecting any chance trifle as embodying it.

**Fétis,** FRANÇOIS JOSEPH, 1784–1871. Belgian musician and author; prof. Paris 1821; director Brussels Conservatory 1833. *Counterpoint and Fugue*, 1824; *Universal Biography of Musicians*, 8 vols., 1835–44; *Harmony*, 1844; *History of Music*, 8 vols., 1869–76.

**Fetticus.** See CORN-SALAD.

**Feuchtwanger,** LOUIS, 1805–1876. German chemist, settled in New York from 1829; designer of the nickel cent of 1837. *Gems*, 1838; *Mineralogy*, 1839; *Fermented Liquors*, 1858; *Soluble Glass*, 1870.

**Feud.** Capital quarrel, or enmity, only satisfied with the death of the foe. It formerly signified a combination of kindred, to avenge the death of any of their blood, against the killer and all his race. See VENDETTA.

**Feudal System.** Political and legal system prevalent in Europe during the Middle Ages. It treated the king as the owner of all the land, out of which he granted portions to favorite subjects upon condition of fealty and military service, they in turn making subinfeudations or grants to their retainers upon like conditions, and having the right to a variety of aids or contributions which were very burdensome. It became practically extinct in Great Britain in the 17th century.

**Feu de Joie.** Ordered by Washington, as Commander-in-chief, in honor of the birth of the Dauphin of France; held May 31 at West Point.

**Feuerbach,** LUDWIG ANDREAS, 1804–1872. German philosopher of the destructive school. His *Essence of Christianity*, 1841, tr. by Marian Evans (George Eliot) 1854. traces religion to its supposed sources in human nature.—His father, PAUL JOHANN ANSELM VON, 1775–1833, Prof. Kiel 1802, Privy Councilor at Munich 1808, Pres. Court of Appeal at Auspach 1817, won high repute as a criminal jurist. His last work dealt with Kaspar Hauser's case.

**Feuillants.** Congregations of reformed Cistercians in France, dating from 1567; named from an abbey in Languedoc, 19 m. s.w. of Toulouse. A house of this order in Paris gave the name to a club formed by Lafayette and other moderate Republicans 1790–91, and thence to the right wing of the Assembly.

**Feuillet,** OCTAVE, 1812–1890. French dramatist and novelist; Academician 1862. *Romance of a Poor Young Man.*

**Feuilleton.** Part of a French newspaper devoted to literary matter; begun 1800 in the *Debats* as dramatic criticism: hence, a serial novel, such as began to appear ab. 1845.

**Féval,** PAUL HENRI CORENTIN, 1817–1887. French novelist. *Thrice Dead*, 1869.

**Fever.** Elevation of the bodily temperature above the normal, 98.6° F. and due as a rule to the presence in the blood of some poisonous substance, micro-organisms or the ptomaines developed by them; it may be also due to fatigue, injury, exposure to high temperatures, or occur as a symptom of some other disease or condition, such as teething. It is always an accompaniment of inflammation of any kind and the formation of pus; it is a symptom rather than a distinct entity. A temperature of 100° F. indicates that the disease is mild, one of 104° F. that the condition is grave, and if it reaches 109° F. a fatal result is almost inevitable. Fever is combatted by cold baths, quinine, and such drugs as antipyrine, antifebrin or phenacetin. See FEBRIFUGES.

**Feverbush.** See BENJAMIN BUSH.

**Feverfew.** See FEATHERFEW.

**Feverwort.** Plants of the genus *Triosteum*, coarse herbs of the Honeysuckle family, natives of e. N. America; known also as Horse Gentian.

**Few,** WILLIAM, 1748–1828. Member Continental Congress from Ga. 1780–82 and 1785–88, and of the Constitutional Convention 1787; U. S. Senator 1789–93; in N. Y. from 1799.

**Feydeau,** ERNEST, 1821–1873. French novelist of the decadent school. *Sylvie* is his best book.

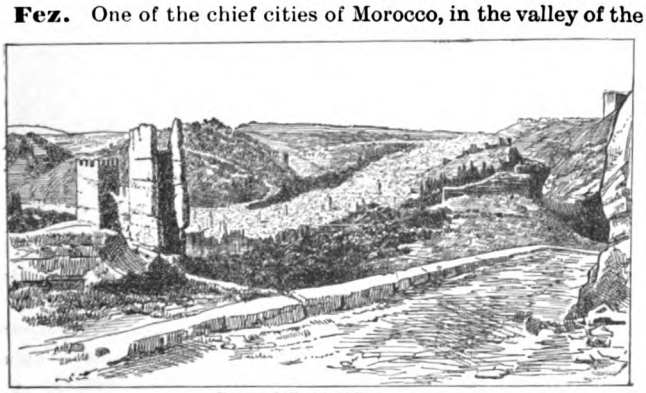
**Feyen,** EUGÈNE, b. 1815. French painter.

**Feyen-Perrin,** FRANÇOIS NICOLAS AUGUSTIN, 1820–1888. French painter.

**Feyjoo,** BENITO, 1701–1764. Spanish essayist. *Teatro Critico*, 16 vols., 1726–33.

**Fez.** Red cap worn by Turks; first made at Fez.

**Fez.** One of the chief cities of Morocco, in the valley of the



General View of Fez.

Wad el Jubar; formerly an Arab seat of learning, and now an important center of trade. Pop. ab. 100,000.

**Fezzan.** Province of N. Africa, s. of Tripoli, and politically dependent on it since 1842. It has ab. 50,000 inhabitants of mixed descent, who belong to the Sunnite sect of Mohammedans. Murzuk, the principal town, has a pop. of 6,500. Perhaps a tenth of the soil is cultivable. The Romans conquered this region 20 B.C.; the Mohammedans ab. 650.

**Fiasco.** Failure, especially in a musical or theatrical performance.

**Fiat Money.** Inconvertible paper, supposed to derive value and currency from legislation.

**Fiber.** Bundle of slender, strong cells of inner or bast layer of the bark in dicotyledonous plants; or fibrovascular bundle in the stem or leaves of monocotyledons; also, slender divisions of the root.—Also, woody structure of fodders. It has the same composition as the carbohydrates, and is somewhat digested by the animal, but is usually thought to be of little use in animal nutrition.

**Fibrillæ.** Threadlike strands of protoplasm in cells. The axis-cylinder of a nerve fiber is the extension of this fibrillar network from the ganglion cell.

**Fibrillose.** Readily separating into fibers.

**Fibrin.** Nitrogenous substance containing also carbon, hydrogen, and oxygen, insoluble in water and obtained from blood and from vegetable sources. It is an albumen compound. See ALBUMEN.

**Fibrinogen.** Supposed to be one of the substances contained in the blood plasma, which by its union with a second, fibrinoplastic matter, forms fibrin.

**Fibro-.** Prefix, signifying that a structure is fibrous or contains fibrous tissue.

**Fibro-Cartilage.** Tough and elastic variety of cartilage, as that forming the disks between the vertebræ.

**Fibroid,** FIBROID TUMOR, or FIBROMA. Non-malignant tumor consisting of fibrous or dense connective tissue.

**Fibroid Phthisis.** Variety in which the connective tissue of the lungs becomes thickened and contracts, causing a slow diminution in their size and capacity; may be protracted for years and simply be a source of inconvenience to the person.

**Fibrolite.** $Al_2SiO_5$. Fibrous aluminium silicate; variety of Sillimanite.

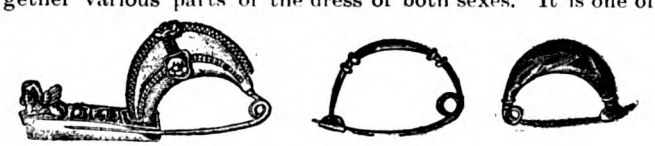
**Fibrospongiæ.** See PLETHOSPONGIÆ.

**Fibrous Tissue.** Form of connective tissue which has a fibrous appearance on account of nearly all the fibers running in one direction. It is usually dense and of great strength.

**Fibro-vascular Bundles.** The fibers of prosenchymatous tissue which collectively compose the woody system of plants, made up of ordinary wood-cells, ducts, cribrose cells, etc.

**Fibula.** Outer and smaller of the two bones of the lower leg.

**Fibula.** Brooch, buckle, or clasp, used for fastening together various parts of the dress of both sexes. It is one of



Etruscan and Roman Fibulæ.

the commonest ornaments of all ancient nations, and is found in ivory, bronze, silver, gold set with gems, of every variety of form and elaborately ornamented.

**Fichte,** JOHANN GOTLIEB, 1762–1814. German philosopher, prof. at Jena 1794, Erlangen 1805, and of Berlin 1810; disciple and successor of Kant, prominent in the political regeneration of Germany against Napoleon. *Critik aller Offenbarung*, 1792; *Wissenschaftslehre*, 1795; *Bestimmung des Menschen*, 1800; *Religionslehre*, 1806. His works exerted great influence; most of them exist in English versions. His system was a lofty idealism, in harmony with his pure and earnest character.—His son, IMMANUEL HERMANN VON, 1797–1879, was prof. at Bonn 1836 and Tübingen 1842–63. *Theologie*, 1846; *Ethik*, 1850–53; *Anthropologie*, 1860; *Psychologie*, 1864.

**Fichtelgebirge.** Mountain-chain in n.e. Bavaria. Greatest ht. 3,461 ft.

**Ficino,** MARSIGLIO, 1433–1499. Florentine Platonist, from 1463 head of an academy founded by the Medici for Greek study; translator of Plato and most of the Neoplatonists. His effort to fuse or identify this philosophy with Christian doctrine had a far-reaching influence.

**Fick,** ADOLF EUGEN, b. 1820. Prof. Zurich 1852 and Würzburg 1862; writer on physiology and medicine.

**Fick,** AUGUST, b. 1833. Prof. Göttingen 1876, Breslau 1888. *Worterbuch der Indogermanischen Sprachen*, 1868–70; *Homerische Odyssee*, 1883; *Iliad*, 1885.

**Ficoideæ.** Family of flowering plants of the class *Angiospermæ* and sub-class *Dicotyledons*, comprising 24 genera and

ab. 445 species, distributed throughout tropical and temperate regions.

**Fiction.** Most abundant department of modern literature, existing chiefly in the forms of the NOVEL (q.v.) and short story.—In law, assumption as true, for a purpose, of something false, undefined, or non-existent; common in Roman procedure, and in all subsequent legal systems; *e.g.*, "John Doe" and "Richard Roe" in ejectment cases.

**Fid.** Square bar of wood or iron with shoulders at one end, used to support the weight of the topmast when erected at the head of a lower mast. Also a conical piece of wood used to extend the strands of a rope when splicing.

**Fidei Commissum.** Testamentary gift of property to a trustee for persons whom the old Roman law declared incapable of taking it. At first, the performance of the trust depended solely upon the good faith of the trustee; later it was made compulsory by legislation.

**Fidelity.** Conformity of actions to engagements, whether express or implied.

**Field.** Of force, whether gravitational, electrical or magnetic; any region throughout which the force acts. Each point in a field has two elements, the intensity of the force and its direction.

**Field,** DAVID DUDLEY, LL.D., 1805–1894. Member of Commission to reform legal practice in N. Y. 1847, and one of the authors of the proposed codification of the entire law 1857–65. *Outlines of International Code*, 1872; *Speeches, Arguments*, 3 vols., 1884–90.—Of his brothers, STEPHEN JOHNSON, LL.D., b. 1816, became Judge Cal. Supreme Court 1857, and Associate Justice U. S. Supreme Court 1863; to CYRUS WEST, 1819–92, were due the initiation of the Atlantic Cable and its success, after long delays and difficulties in 1866; HENRY MARTYN, D.D., b. 1822, ed. N. Y. *Evangelist* from 1854, has pub. *Hist. Atlantic Telegraph*, 1866; *Our Western Archipelago*, 1895, and other books of travel.

**Field,** EUGENE, 1850–1895. Poet and journalist, in Chicago from 1883. *Tales*, 1889; *Verse*, 1889–93; *With Trumpet and Drum*, 1892.

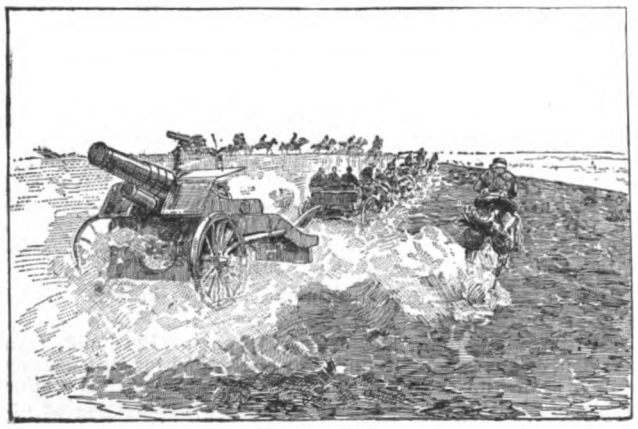
**Field,** FREDERICK, LL.D., 1801–1885. English O. T. reviser; editor of Chrysostom and Origen.

**Field,** JOHN, 1782–1837. Irish pianist and composer, pupil of Clementi. His nocturnes, though few, are now on concert lists, and were of vast influence in the development of Chopin's style.

**Field,** JOSEPH M., 1810–1856. Anglo-American actor, dramatist, and journalist.—His daughter, KATE, b. 1840, founded *Kate Field's Washington*, 1889.

**Field,** MICHAEL. Pen-name of two English poets, aunt and niece. Their works are chiefly dramas in blank verse. *Callirhoe*, 1884: *Long Ago*, 1889.

**Field Artillery.** Branch possessing such mobility as to be used with cavalry and infantry. The guns are mounted on wheeled carriages and drawn by four or six horses harnessed in



Field Artillery.

pairs. A driver is mounted on the nigh horse of each pair for facility in guiding. In light batteries, the cannoneers are mounted on the ammunition chests of the limbers and caissons; in horse batteries, on horses.

**Field** (or LIGHT) **Battery.** Six 3.2-inch B. L. Rifles with their limbers, caissons, and combined battery wagon and forge. The personnel consists of one captain, two first and two second lieutenants, seven sergeants, four corporals, two musicians, two artificers, one wagoner, and fifty-nine privates.

**Field Carriage.** Used to support, in U.S. service, the light steel field gun of 3.2 inches caliber. The carriage is made of steel, each cheek being formed of two pieces riveted together and strengthened by flanges at top and bottom. The cheeks rest in front on the axle and reënforcing plate and are held together in rear by the trail plate which carries the lunette. The axle is of steel and is inclosed between two steel re-enforcing plates, the better to resist recoil. The wheels are of the Archibald pattern, with metallic naves and tire. The limber is hooked to the gun carriage by a large hook called the pintle, which passes through the lunette ring on the gun carriage, and the whole thus forms a four-wheeled carriage. The limber chest carries 42 rounds of ammunition: the caisson (another four-wheeled carriage) carries the supply ammunition in three chests similar to the limber chest; the total number of rounds is then 168, of which all but a few are shrapnel with a combination fuse, these few being canister and percussion shell.

**Field Fortification.** Branch of military engineering pertaining to the art of constructing temporary defenses for the protection of an army in active operations in the field; also earthworks.

**Field Glass.** Binocular Galilean telescope or opera glass, of large aperture for illumination, and an eye-piece of considerable magnifying power. It gives an erect image, wide field of view, and that steadiness of vision necessary for rapid military observation.

**Fielding,** ANTHONY VANDYKE COPLEY, 1787–1855. English water-color painter.

**Fielding,** HENRY, 1707–1754. English novelist. Till 1737 he wrote farces and comedies, as *Pasquin* and *The Historical Register*. His first important work, *Joseph Andrews*, appeared 1742, and was followed, after an interval of editing, by *Tom Jones*, 1749, and *Amelia*, 1751. From 1749 he was a police magistrate in London. *Jonathan Wild* was vol. iii. of his *Miscellanies*, 1743.

**Field Intrenchment.** These embody the earthworks employed to cover intrenched camps, lines of battle, detached works on important points for temporary possession, siege works, and auxiliary construction for permanent works when immediate necessity arises for their use.

**Field-Marshal.** Highest rank in most European armies; non-existent in U. S.

**Field-Mice** (*Arvicola*). In England, Voles. Very numerous in species, variable in size. They burrow usually near

Field-Mice (*Arvicola arvalis*).

water, in meadows, have short limbs and tail, blunt muzzle, ears almost concealed, and are very prolific.

**Field-Officers.** Colonels, lieutenant-colonels, and majors.

**Field of the Cloth of Gold.** Near Calais, France, where Francis I. and Henry VIII. met in June, 1520.

**Field-Piece.** Light artillery gun for use in the field with rapidly moving troops. At present there are in the U. S. service the model of 1885 and 1890. The latter is a steel breech-loading rifled gun comprising only two principal forgings, the tube and the jacket, the latter bearing the trunnions. It is 7.56 ft. in length, 3.2 in. caliber and ab. 830 lbs. weight; it fires a projectile of 13.5 lbs. with a charge of 3.5 lbs. of powder, giving an initial velocity of 1,685 f. per sec. and a muzzle energy of 265 ft. tons. There are 24 grooves with a rifling twist of one turn in 30 calibers. Its vent is axial.

**Fields,** JAMES THOMAS, LL.D., 1817–1881. American poet and essayist; member of the chief publishing firm of Boston,

and ed. *Atlantic Monthly*, 1862–70. *Yesterdays with Authors*, 1871; *Hawthorne*, 1876.—His widow, ANNIE ADAMS, has pub. his memoir, a volume of verse, and *A Sheaf of Old Books*, 1894.

**Field Tubes for Boilers.** Form of vertical water tube in which a second tube of smaller diameter fits concentrically in the outer tube. The outer tube screws into the shell at its top, and is closed at the bottom; the inner tube is open at both ends, and does not reach quite to the bottom of the outer. The water rises at the warm outside of the tube and descends in the inner cooler tube. A very rapid circulation is thus caused, which keeps the tubes free from dirt and scale, and makes the tube surface very efficient. Used in fire-engine boilers in this country.

**Field Works.** Inclosed earthen fortifications reveted with materials of a temporary durability, as gabions, fascines, timber, designed to enable a small body of troops to hold a position for a limited time against a much superior force. There are three classes; viz., those assailable only in front as redans, in front and flank as lunettes, and those on all sides, as redoubts. The greater efficiency of modern firearms will undoubtedly give to such works a greater defensive value than they have possessed heretofore.

**Fierasfer.** Genus of acanthopterygian fish of serpentine form. They live inside the Sea Cucumber (Holothurians) and are transparent, the circulatory and other internal organs being visible. They grow to a length of five inches or more. They back into their host through the cloaca, during the time when the water for the respiratory trees is being expelled and a new supply taken.

**Fieri Facias.** Writ directing an officer that he cause to be made out of the debtor's goods or lands the amount of a judgment.

**Fieschi,** or **Fiesco,** GIOVANNI LUIGI, 1523–1547. Count of Lavagna; head of a conspiracy against Doria and the government of Genoa, which failed only through his accidental drowning at the critical moment.

**Fieschi,** GIUSEPPE MARIA, 1790–1836. Corsican jailbird, who tried to kill Louis Philippe with an infernal machine July 28, 1835; executed with his accomplices.

**Fiesole,** FRA ANGELICO DA (GUIDO DI PIETRO), 1387–1455. Italian monk and painter, of the Florentine School. He painted frescoes in two chapels of the Vatican, and greater ones in the Orvieto Cathedral and the Convent of San Marco,

St. Lawrence giving Alms. (Fiesole, Vatican.)

Florence. He has important altar-pieces in the Louvre, Berlin, and National Galleries, and still more important pictures in the Florence Academy and Uffizi. In this last gallery is the large Madonna surrounded by a frame design of pictured angels making music. These angels, on a gold background, have been widely copied and are his most extensively known paintings. By original training he was a painter of miniatures for missals; thence the deep colors and carefully minute execution of his oil paintings; but in contrast with this delicate and tender style he developed in fresco one of great power, as the wall pictures in the cells of San Marco. He is rather opposed to the generally realistic bent of his period, and stands in closest relation with the preceding period of Giotto, whose pictures at Assisi were his models in youth. In religious fervor and in devotional spirit he had no equal in his own time and no superior in that preceding.

**Fife.** Musical instrument resembling the flute, with one key or none; formerly used in armies with the drum. It is the most ancient of reed instruments.

**Fifteen Puzzle.** Fifteen movable blocks numbered from 1 to 15 in a square box, the object being to restore the numerical sequence by moving one block at a time, when the blocks are placed in other than their natural order; invented 1872 by Samuel Lloyd, and an offshoot of a well-known magic square problem.

**Fifth Monarchy Men.** English sect of Second-Adventists who believed that the four great world-powers (Dan. vii.) were to be succeeded by a fifth, under the personal reign of Christ. They attempted insurrections 1657 and 1661.

**Fig.** *Ficus carica.* Small tree of the natural family *Moraceæ* or Mulberry family, native of Asia; widely cultivated

Common Fig (*Ficus carica*).
*a*, fruit; *b*, section of fruit.

for its edible fruit, most of which is grown in the Mediterranean region.

**Fig,** INDIAN. See PEAR, PRICKLY.

**Fig-Marigold.** See ICE PLANT.

**Figueras,** ESTANISLAO, 1819–1882. Spanish Liberal Deputy 1850; imprisoned 1866; Pres. Republic Feb.–June 1873.

**Figueroa,** FRANCISCO DE, 1540–1620. Spanish poet, who wrote also in Italian.

**Figueroa,** PEDRO PABLO, b. 1857. Chilian novelist, biographer, and journalist.

**Figuier,** GUILLAUME LOUIS, b. 1819. French scientific writer. *Découvertes Modernes*, 3 vols., 1851–53; *Ocean World; World before the Deluge.* His wife, Juliette, has pub. novels.

**Figurantes.** Those dancers who form the corps de ballet, dancing in companies and not alone.

**Figurate Numbers.** Lines formed by making an Arithmetical Progression the differences of a series, and this again the differences of a higher series. Each Progression may be made the first order of a group of figurate series.

**Figured Bass.** In Music, bass having the accompanying chords suggested by certain numbers placed above or below the notes.

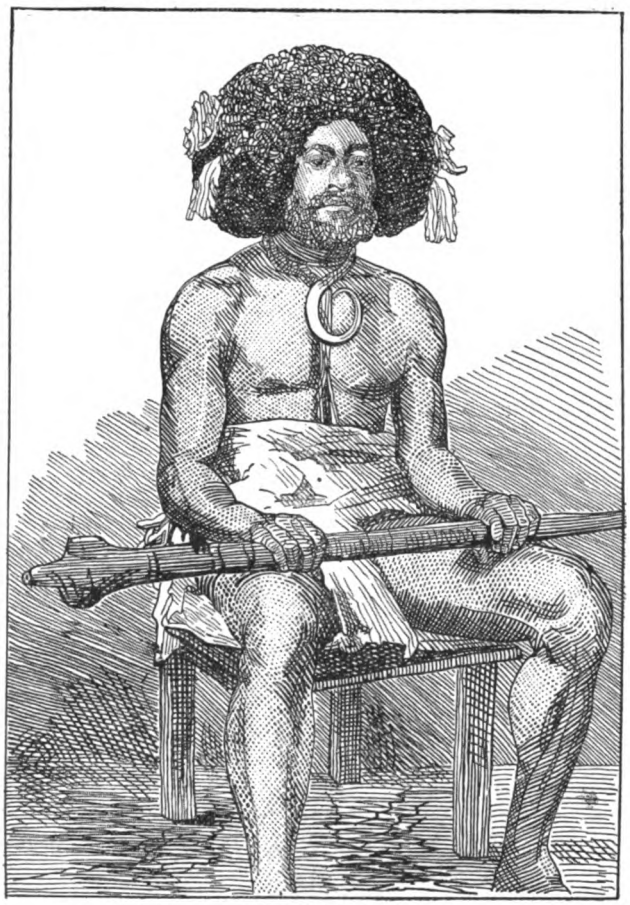
**Figurehead.** Carved and painted figure, representing the name of the ship, still frequently found at the prow beneath the bowsprit.

**Figures of Speech.** Expressions not literally accurate, and involving more or less imaginative departure from plain prose. They usually indicate resemblance, as Metaphor, or relation, as Metonymy and Synecdoche.

**Figwort.** Plants of the genus *Scrophularia*, natural family *Scrophulariaceæ;* coarse herbs, natives of the n. hemisphere.

**Fiji Islands.** Group in the S. Pacific, numbering over 200, belonging to Great Britain since 1874; discovered 1643; total area 7,435 sq. m.; pop. 125,000, of whom 2,000 are Europeans.

The natives are well-formed, with dark-blue eyes, brown skin, and dolichocephalic skulls of rather large capacity. They are



Fiji Islander.

intelligent and good-natured, have accepted Christianity, and given up cannibalism and sacrifice of the feeble and widows.

**Filament.** Stalk-like portion of the stamen which supports the anther.

**Filangieri,** GAETANO, 1752–1788. Neapolitan author of a treatise on legislation 1780–88.—His son, CARLO, Duke of Taormina, 1783–1867, was Prime Minister of Naples.

**Filariasis.** Chyluria; softening of the glands or hæmaturia, due to *Filaria sanguinis hominis.*

**Filaridæ,** or NEMATODA. Thread-worms, characterized by long body, with a mouth armed with a horny capsule, or with six papillæ, and having four pairs of præanal papillæ. *Filaria medinensis* (*Dracunculus*), the "Guinea worm," two or more feet long, lives under the skin of man in the Eastern tropics. It forms an abscess, in which it produces young viviparously and parthenogenetically. The young escape from the abscess, and if into water, they get into *Cyclops*, and are thus reintroduced into the system. *F. sanguinis hominis* is a larva which lives in the blood of man; similar forms are parasitic in the dog. They are present in the urine in the disease hæmaturia, and are regarded as causing CHYLURIA and ELEPHANTIASIS (q.v.).

**Filbert.** See HAZEL-NUT.

**Fildes,** SAMUEL LUKE. b. 1844. English figure-painter and illustrator. R. A. 1887.

**File.** Hand tool, acting by abrasion for shaping and smoothing. A bar of soft steel of the desired section has ridges or teeth raised upon its surface by the action of an inclined chisel, which makes nicks and throws up a burr, forming the tooth. The bar is subsequently hardened. An increase-cut file is one in which those parts on which greater pressure can be exerted are cut with ranker teeth. With respect to the coarseness of the teeth, files for metal are known as bastard, smooth, dead-smooth, and double dead-smooth. Where the cutting chisel is passed a second time over the file-bar, cutting at the same angle with one edge which was used for the first cut with the other edge, the file is a second-cut file, and is sharper. Usual sections are flat, square, round, and half-round, for the larger sizes. Safe-edges are edges left uncut for work in slots and key-ways. Files are made by hand and by machine.

**Filelfo.** See PHILELPHO.

**Filibusters.** Adventurers who, after the war between the U. S. and Mexico, organized expeditions against the Spanish West Indies. See WALKER, WILLIAM.

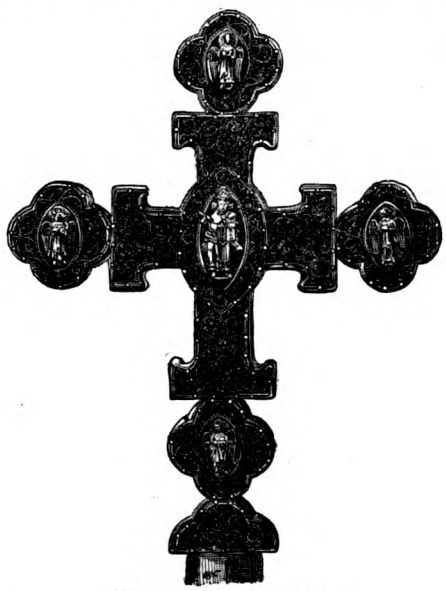
**Filicaja,** VINCENZO DA, 1642–1707. Italian lyric poet, famous for his sonnets and for six odes in honor of the deliverance of Vienna from the Turks by Sobieski 1683; Senator of Florence 1673.

**Filices** (FILICINEÆ). Order of the sub-kingdom *Pteridophyta*, including the ferns. There are ab. 3,000 species, widely distributed over the earth, but most numerous and of greatest dimensions in tropical regions, where they form large trunks and are called tree-ferns. They are of very little economic importance, but are among the most graceful and beautiful of plants.

**Filicoid.** Related to or resembling ferns.

**Filicology.** Science of ferns. See PTERIDOLOGY.

**Filigree.** Jewelers' work in silver and gold wire; used for



Byzantine Filigree Work.

ornamentation from the earliest times by Egyptians, Greeks, and other races in all parts of the world.

**Filioque Controversy.** In the Creed the Orientals declare the Spirit to proceed from the Father; the Latins add "and the Son." This difference was a chief ground of the great schism of 1054.

**Fillan.** Two Scotch-Irish saints, whose days are Jan. 9 and June 20.

**Fillet.** Band, used in architectural nomenclature to denote a convex molding. The edges dividing the recessed channels in fluted columns are also called fillets. The term is applied to moldings of small dimensions only. A large molding similar in form is called a roll or a torus.

**Fillmore,** JOHN COMFORT, b. 1843. Teacher of music at Milwaukee, Wis. *Hist. Pianoforte Music*, 1883; *Harmony*, 1886.

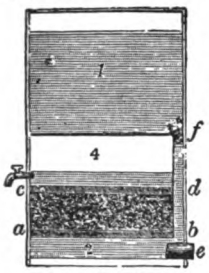
**Fillmore,** MILLARD. 1800–1874. Thirteenth Pres. of the U. S.; M. C. 1833–35 and 1837–41. In 1848 he was elected Vice-Pres., and on Taylor's death, July 9, 1850, succeeded to the Presidency. The country was embroiled over various compromise measures affecting slavery, and F. became unpopular with Whigs and anti-slavery men by signing the Fugitive Slave Law.

**Filmer,** SIR ROBERT, ab. 1589–1653. English political writer who pushed the divine right of kings to its extremest length. *Anarchy of a Limited Monarchy*, 1646; *Freeholder's Grand Inquest*, 1648; *Power of Kings*, 1648. His *Patriarchia*, 1680, was discussed by Locke.

**Filoplumæ,** or FILOPLUMES. Hair-like feathers with slender rachis, the barbs without barbicells. When no barbs are present, but the rachis is stiff, they are termed vibrissæ.

**Filosa.** Section of *Gymnomyxa*, including the classes *Labyrinthulidea*, *Heliozoa*, *Radiolaria*, and *Foraminifera*. The group is characterized by the possession of thread-like pseudopodia.

**Filters.** Devices for separating from water or other fluids suspended insoluble matters. Water filters usually consist of vessels containing gravel and charcoal or coke of varying degrees of fineness, the coarser particles being at the top, through which the water passes; porous stone is also employed. For filtering of large volumes, as in the case of the water supply of a community, large sand and gravel beds are employed. Disease germs are not separated by filtration, except when large masses of material are used, when if sufficient air is present multitudes of harmless species are produced which destroy those dangerous to health. Filters should be cleaned frequently and the materials renewed. One sq. ft. of surface is required to filter 90 gals. in 24 hours. The expense of filtration is from $1 to $3 per million gallons, not including interest in the plant.



Leloge's Filter:
1, impure water flowing into 2 through tube; *ab*, the first porous stone of 3, filtering compartment, charcoal; *cd*, the exit filtering stone; *e*, the plug to remove for cleaning out second compartment; *f*, a loose sponge at entrance of communicating tube.

**Filth.** All kinds of offensive matter especially when susceptible of decomposition. By itself is incapable of generating disease, but furnishes a most admirable vehicle for the growth and spreading of every form of disease germ.

**Filum Aquae.** Thread or middle line of a stream forming the boundary between States, or between private property owners.

**Final,** or MARGINAL. In Economics, last utility, value, product, or amount which effort will be expended to bring about, any less return not being worth the effort.

**Final Cause.** Object or end for which a thing is done.

**Finale.** Last movement of an instrumental composition, or closing passage of an act in opera.

**Final Utility.** See MARGINAL UTILITY.

**Final Velocity.** That which a projectile would acquire in the descending branch of the trajectory when the retarding influences of the air resistance becomes equal to the acceleration of gravity. It differs from the terminal velocity, or that of the projectile at the instant of striking; it is technically used in problems of exterior ballistics.

**Finance,** SCIENCE OF. Study of methods and effects of the imposition and collection of public revenue, and of its expenditure by governments general and local.

**Financial Panics.** Periods of sudden disturbance of the business world, arising from some disorganization of credit, currency, or other financial rather than commercial element of the economic condition.

**Finch.** See CONIROSTRES and FRINGILLIDÆ. Several genera of sparrows or sparrow-like birds are popularly called finches. Some, as Canary (*Serinus*) and Bullfinch (*Pyrrhula*), make fine songsters in confinement. The Chaffinch (*Fringilla*) is the typical Finch of Europe. In America the Purple Finch (*Carpodacus*) has a flush of red in male; the female is olive-brown, streaked below, the tail feathers soft and rounded; length without tail 3½ in. The Goldfinch (*Chrysomitris*) has acute bill, yellow on bases and edges of quills, male rich yellow, length 3 in. without tail; also called Thistle-bird and Yellow-bird. The Lark-finch (*Chondestes*) of the prairies has tail 3 in. long, and is much streaked with black, white, and chestnut.

Finches.

**Finch,** FRANCIS MILES, LL.D., b. 1827. Judge of N.Y. Court of Appeals 1881; Dean of Cornell Univ. School of Law, 1892; author of *The Blue and the Gray*, 1867, and other lyrics.

**Finch,** HENEAGE. See NOTTINGHAM.

**Finch,** SIR HENRY, d. 1625. Author of a *Description of the Common Law of England*, pub. in Latin 1613, tr. 1627; the chief predecessor of Blackstone's *Commentaries*.

**Fin de Siécle.** Epithet signifying what is characteristic of the end of the century, more especially of the license in social manners prevalent during the French Revolution.

**Finding.** Conclusion reached by vote of the officers composing a court-martial, beginning with the vote of the junior member, and continuing in order of rank, upon the question of the guilt of the accused, as to each specification of each charge. After the finding the Court proceeds to fix upon the sentence, if the accused has been found guilty.

**Finding Property.** This entitles the finder to hold it against every one but the true owner. If the finder takes it into his possession he must exercise due care of it, and must make due effort to find the owner, to whom he must restore it upon being reimbursed the expense of caring for it.

**Findlater,** ANDREW, LL.D., 1810–1885. Ed. Chambers' *Encyclopædia*, 1861–68; *Information for the People*, 1857; *Miscellany*, 1869–71, and other works.

**Findlay.** Capital of Hancock co., Ohio. It has manufactures of iron and glass. Center of a natural gas field. Pop., 1890, 18,553.

**Findlay,** ALEXANDER GEORGE, 1812–1875. Author of a series of official sailing directions for the British navy and of special notes on ocean meteorology.

**Fine.** 1. Sum imposed as a punishment. Excessive fines are prohibited by the U. S. Constitution. 2. Method of conveying land, now obsolete.

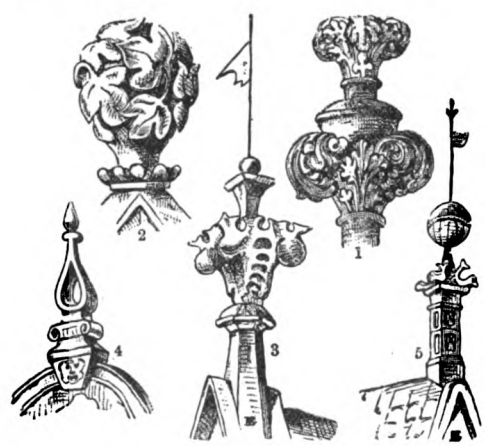
**Fine,** ORONCE, 1494–1555. French mathematical pioneer.

**Fine Arts.** Those which occupy themselves wholly with the expression of beauty: architecture, sculpture, and painting.

**Fingal's Cave.** On Is. Staffa, on w. coast of Scotland, 227 ft. long, with an entrance 66 ft. high by 40 wide. The front and sides consist of ranges of gigantic basaltic columns, and the whole is hollowed by action of the sea from rock of volcanic origin.

**Finger Grass.** See CRAB GRASS.

**Finial.** In Mediæval Architecture, a terminal ornament employed to decorate any vertical feature ending in an angle, as a spire or gable. A conventionalized bud or a fleur-de-lis is a common form of finial.

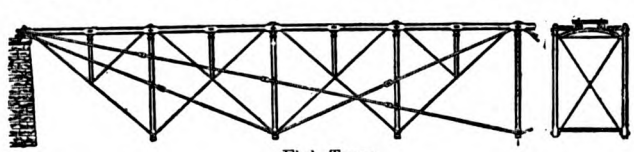


Finials:
1, from Bishop Bridport's Monument, Salisbury Cathedral; 2, York Minster; 3, Maulbronn, Germany; 4, Crew Hall, Cheshire; 5, Augsburg.

**Fining.** Process of making wines and liquors bright and clear. See CLARIFICATION.

**Fink,** ALBERT, b. 1829. Civil engineer and financier; inventor of the F. bridge truss; commissioner of the Trunk Line Association; Pres. Am. Soc. Civil Engineers 1890.

**Fink Truss.** Bridge truss invented ab. 1860, consisting of several systems and sub-systems of king post trusses. It was much used prior to 1880 in the Southern and Western States.


Fink Truss.

**Finland.** Grandduchy of n.w. Russia, bounded on the s. by the Gulf of F., on the w. by the Gulf of Bothnia and Sweden. Area 144,000 sq. m.; pop., 1889, 2,338,404. The FINNS (q.v.) came to the country ab. 700, and were conquered and Christianized by Sweden 1157–1293. The Reformation was introduced 1528. In 1809, after many wars, the country was ceded to Russia, but is governed under its own constitution of 1772.

**Finland,** CHURCH OF. Lutheran, till lately one with that of Sweden; chief officer, Abp. of Abo. It includes 98 per cent of the population.

**Finland,** GULF OF. Arm of the Baltic Sea, extending into Russia.

**Finlay,** GEORGE, LL.D., 1799–1875. English Philhellenist, resident at Athens from 1823; historian of Greece from the Roman conquest to 1864. His works, 1843–61, were reprinted in 7 vols. 1877.

**Finley,** JOHN PARK, b. 1854. Lieutenant in the Signal Corps, writer on Tornadoes 1890, and first to make extensive collection of data showing their geographical distribution in the U. S.

**Finley,** SAMUEL, D.D., 1715–1766. Pres. Coll. of N. J. 1761.

**Finney,** CHARLES GRANDISON, 1792–1875. American evangelist; prof. at Oberlin Coll., O., from 1835, Pres. 1852–66. *Revivals*, 1835; *Systematic Theology*, 1846; *Autobiography*, 1876.

**Finnish.** Language spoken by inhabitants of n.w. Russia; a branch of the Mongolian or Scythian family. Its chief literary monument is the famous *Kalevala*.

**Finns.** Descended from a Mongolian race which dwelt in Europe before the invasion of the Celts, Greeks and Latins. Remnants are also found in Hungary and Lapland. The Finns

Types and Costumes in Finland.

have a university and a literature; they are deeply moral and religious. Physically they have Turanian characteristics, dark hair and eyes, strong jaws and broad low foreheads.

**Fins of Fishes.** Of two sorts: (1) the median, as the dorsal, caudal, and anal; (2) the paired, as the ventrals and the pectorals. The pectorals correspond to the fore-limbs, the ventrals to the hind-limbs. The latter are, in some fishes, below and between the pectorals (thoracic position), or on throat in front of pectorals (jugular position).

**Finsch,** FRIEDRICH HERRMANN OTTO, Ph.D., b. 1839. German explorer in Siberia, Australia, and New Guinea; prolific writer on scientific topics.

**Fiord.** Deep, narrow inlet from the sea, usually inclosed by mountains, as on the coasts of Norway, British Columbia, and Alaska.

**Fiorelli,** GIUSEPPE, b. 1823. Director of excavations at Pompeii and elsewhere in Italy; Prof. of Archæology Univ. Naples; Senator 1865.

**Fiorin.** *Agrostis alba.* Valuable pasture grass, native of colder parts of n. hemisphere; widely planted. Known also as White Bent Grass.

**Fiorite.** $SiO_2$. Siliceous sinter, resulting from the natural alteration of rocks of volcanic origin, or deposited from the waters of hot springs.

**Fir.** Large, coniferous trees of the genus *Abies*, natives of northern and mountainous regions of the n. hemisphere. The N. American Balsam Fir or Canada Balsam is *A. balsamea*.

**Firdausi,** 940–1020. Persian poet, author of the *Shah-Nameh* or *Book of the Kings*, a poem of nearly 60,000 lines, based upon earlier writers. His *Yúsuf and Zuleikha*, in 9,000 lines, was written during his wanderings, after his enemies had deprived him of the great reward promised for his first poem.

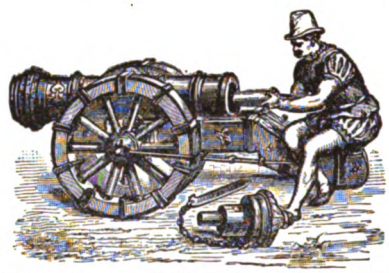
**Fire.** Production of light and heat by the combustion of substances; from ancient times regarded as an elemental substance and not understood until the development of the modern theory of combustion and the nature of the physical forces of light and heat. It is now restricted to the combustion of solid, liquid, or gaseous materials in which light and heat are produced. See COMBUSTION, FIRE WORSHIP, FLAME, FUEL, HEAT, LIGHT, and MATCHES.

**Fire.** Artillery fire is distinguished by the manner in which the projectile strikes the object, as direct, ricochet, rolling and plunging; by the nature of the projectile, as solid shot, shell, shrapnel, grape, and canister; and by the angle of elevation, as horizontal and vertical.

**Fire-Alarms.** Instruments electrically connected with fire-stations to announce the existence and location of a fire. Public fire-alarms are numerous in all large cities, and in addition many business houses are fitted with automatic devices.

**Fire-Armor.** Devices to protect the lungs and eyes from the dangerous effects of smoke, flame, or gas. All those in the nature of a diving-dress have proved too cumbersome, and the armor now adopted is some kind of a mask fitted with an air-filter, containing charcoal and slacked lime.

**Firearms.** Military weapons designed to throw projectiles by means of explosives, generally gunpowder; classed as



German Breech-loading Cannon of 16th century.

Cannon and Small-arms. The former comprise guns, or relatively long cannon, howitzers, or short cannon, and mortars, or very short cannon, all of which require carriages for their

Pistol Battle-ax.

transportation and support. Small-arms, or muskets, pistols, carbines, etc., are portable weapons, whose calibers are small compared with their length. See CANNON, CARBINE, etc.

**Fire Balloon.** The air within is expanded and rendered lighter by burning alcohol or other combustible substances in an opening at the bottom. See BALLOON.

**Fireballs.** Projectiles composed of combustible ingredients formerly cast among the enemy to burn or give light, smoke, or stench. The Greeks used several kinds, asphaltum, niter and sulphur being the usual constituents. The fire arrow was wrapped with tow dipped in pitch. In more recent times shell filled with powder and other materials with time fuses were used.

**Fireblende.** Pyrostilpnite. Sulphide of silver and antimony; 62.3 per cent silver.

**Fire-Boss.** Person charged with the duty of watching for the occurrence of dangerous gases in a coal-mine.

**Fire-Box.** That part of an internally fired boiler in which the combustion of the fuel takes place. The sheet over the fire is called the crown-sheet; that to which the fire-tubes are secured is called the tube-sheet. At the sides of the fire-box are the water legs, two parallel sheets of plate tied together by stay-bolts. At the bottom of the water legs is the mud-ring. The crown-sheet is held from collapse by the crown-bars or by stays (see BELPAIRE FIRE-BOX); the opening for the fire-door through the water leg is made water-tight by a flanged or forged ring. Many fire-boxes have a bridge wall across them, to make a combustion chamber. Fire-boxes for anthracite coal are made larger than for bituminous, since the former acts more by radiation from the incandescent bed of fuel. For burning fine coal, and slack or culm, the area must be made very large, so as to secure slow rates of combustion. In earlier locomotives the fire-box was put between the frames; in many

recent designs the fire-box is over the frames, and much greater area is possible. The Wootten fire-box is of this class. See WOOTTEN.

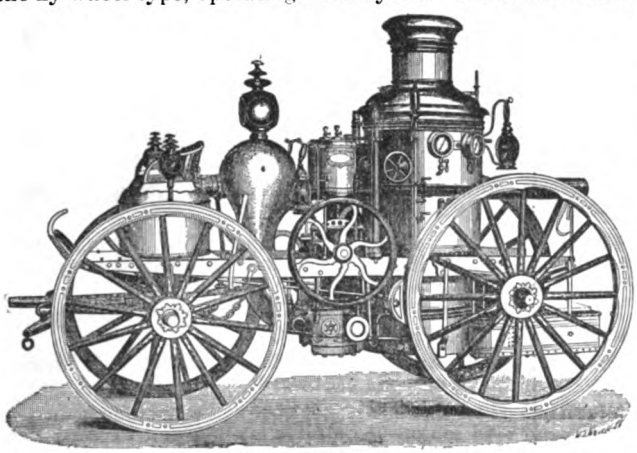
**Fire-Brick.** Refractory siliceous material, used for furnace linings, and made into brick form from fire-clay. Such brick-clay should be free from iron and lime, which would render it fusible. The best American fire-clays come from Mt. Savage, Md., and from Woodbridge and Amboy, N. J.

**Fire-Clay.** Clay sufficiently free from fluxing impurities to enable it to stand extremely high temperatures without fusion. Stourbridge, Eng., clay contains $SiO_2$,63; $Al_2O_3$,23; $CaCo_3$,1; FeO,2; $H_2O$,10.

**Fire Damp.** Combustible gas frequently met in coal mines, consisting chiefly of marsh gas or light carbureted hydrogen, with varying quantities of carbonic acid, oxygen and nitrogen. A mixture of the gas with eight or nine times its volume of air is highly explosive. See MARSH GAS.

**Fire Eater.** Derisive name given to the Secessionists.

**Fire Engine,** STEAM. Portable pumping engine for putting out fires; of two general types, the rotary and the reciprocating. The rotary are more compact and lighter, and can use very inferior water, as they have no valves. They are liable to wear, and do not work so well against great resistances. The reciprocating have one or two pumps, usually of the fly-wheel type, operating with a yoke. The boiler is of the



Steam Fire Engine.

upright type, with a large heating surface relatively to its volume, so as to get up steam rapidly. The exhaust from the pumps turns into the stack to make a forced draft. Some of the larger engines are self-propellers, so as to do away with horse-traction. The rear axle is driven by a chain-gear, and one wheel is fitted with a differential bevel-gear device so as to enable corners to be turned. Large steamers will throw a 1¾ or 2-in. stream for above 200 ft. horizontally. The height depends mainly on the pressure and on the length of hose. For one-inch smooth nozzle a pressure of 50 lbs. per sq. inch at the steamer or hydrant will throw an effective stream 64 feet high when the hose is 50 feet long, 58 feet high when it is 100 feet long, and 48 feet high when it is 200 feet long. When the pressure is 100 lbs. per sq. inch, the heights are, 89 feet for 50 feet length of hose, 85 feet for 100 feet of hose, and 76 feet for 200 feet of hose. First engine built in England by Braithwaite 1829, and in New York by Ericsson 1840.

**Fire Escapes.** Contrivances for facilitating escape in case of fire. They consist principally of iron steps and balconies outside buildings. In some cases windows are fitted with ropes with sliding gear. The movable escape used by firemen consists of a ladder on wheels fitted with a trough of wire-netting in which people may slide safely to the ground.

**Fire-Extinguisher.** Glass or metallic vessel containing chemical compounds that give off gases that will not support combustion. Carbonic acid is most commonly used as an extinguisher. The common form is a cylinder containing bicarbonate of soda and water, with a bottle of sulphuric acid suspended at the top. When this is broken by a mechanical contrivance within the cylinder, carbonic acid is generated which is absorbed by the water and also forces the liquid from the attached hose, with a pressure of 70 to 120 lbs. and to a distance of 50 feet. Chemical fire-engines are similarly charged.

**Fire Fly.** See LAMPYRIDÆ.

**Fire Insurance.** See INSURANCE.

**Fire Marble.** Aggregate of shells, showing fire-like reflections, and susceptible of a polish like marble; also called Lumachelle.

**Firenzuola,** AGNOLO, 1493–ab.1547. Italian poet and dramatist, whose works reflect the free taste of his age rather than his character as monk of Vallombrosa and abbot of Prate. Tr. Apuleius' *Golden Ass.*

**Fire Opal.** $SiO_2$. Variety of opal that shows fire-like reflections; found in Mexico, and used in jewelry.

**Fireproofing.** Process by which materials and fabrics are rendered uninflammable. For wood asbestos paint would be more useful if it did not peel, a coating of silicate of soda is most efficacious, especially if preceded by a coating of lime wash. Chemicals least injurious to fabrics are sal ammoniac, tungstate of soda, sulphate of ammonia and borax.

**Fireproof Materials.** Brick is one of the best materials in common use for resisting fire. Special materials are magneso-calcite, wire lath covered with mortar, asbestos paper, and terra-cotta lumber, which are much used in floors, ceilings, and walls of fireproof buildings.

**Fireproof Safes.** Iron cases for storing valuables, first made in New York ab. 1830. They have double walls, between which is placed fireproof or heat-resisting materials, as soapstone, gypsum, cement, borax, alum, etc.

**Fires,** COLORED. Combustible mixtures, usually consisting of potassium chlorate, sulphur, lampblack, and the substance which is to give color to the flame. For red fire, strontium nitrate is used; for green, barium nitrate; for yellow, sodium nitrate.

**Fire-Setting.** Method of mine excavation, in which the rock is broken and loosened by the action of hot, strong fires of wood or coal. This method was much in use before the invention of gunpowder, and has been occasionally employed even in recent times.

**Fire-Ship.** Hulk loaded with combustibles sent into hostile harbors and among fleets in the days of wooden vessels. The Spanish Armada was dispersed at Calais 1588 by fire-ships.

**Fire-Syringe.** Pneumatic tinder-box; consists of a piston working air-tight in a small cylinder closed at one end. If a bit of tinder or of cotton moistened with bisulphide of carbon

Fire-Syringe.

or other inflammable substance be placed on the bottom of the piston and the latter vigorously pushed down, the heat developed by the compression of the air will light the tinder.

**Fireweed.** *Epilobium angustifolium.* Herb of the natural family *Onagraceæ*, known also as Willow Herb, native of

Fireweed (*Epilobium angustifolium.*)

n. hemisphere. Also, in N. America, *Erechthites hieracifolia*, large herb of the Composite family. Both are prone to appear in quantities after forest fires.

**Fire Worship.** An important element in most primitive religions, fire being generally regarded as giving life, and by some as the very soul of nature, and the essence of everything. The natural importance, which the preservation of the hearth-fire had in primitive life, led to many observances, the principal functions of the state itself growing out of the care bestowed upon the tribal fire. The idea of purification by fire is very general. The creation of the new fire at recurrent seasons was one of the most solemn rites of the ancient Mexicans.

**Fire-Worshipers.** See PARSEES.

**Firkin.** Liquid measure of ab. 9 gallons, formerly 8 in some cases; also cask holding 56 lbs. of butter.

**Firkowitsch,** ABRAHAM, 1786–1874. Crimean Jew, student and collector of Karaite MSS., 1,500 of which he placed in the Imperial Library at St. Petersburg.

**Firman.** Written order of an Oriental government, granting permission to travel or (in India) to trade; used chiefly in the Sultan's dominions.

**Firmicus Maternus,** JULIUS, 4th century. Sicilian astrologer and mathematician.

**Firmisternia.** Group of anourous *Amphibia*, including the frogs and tree-toads.

**First-Born.** In O. T. the eldest male offspring of man and beast was devoted to God, and might be redeemed by certain ceremonies. The eldest son had especial privileges, but these might be forfeited and transferred, as in the case of Esau.

**First-Fruits.** In O. T., part of the produce of garden and field, offered in oblation to the Lord.

**First Sergeant.** Non-commissioned officer selected by his captain to attend at the adjutant's office, receive the orders of the day, and record them in the orderly book. The minutiæ of discipline, the good temper and behavior of a company depend largely on him.

**Firth.** Scottish estuary, similar to the fiords of Norway.

**Fisch,** GEORGES, D.D., 1814–1881. Swiss Protestant, pastor in Paris from 1854.

**Fischart,** JOHANN, ab. 1550–1589. German satirist, prolific writer in verse and prose. *Eulenspiegel*, 1572; *Flöhhatz*, 1573; *Gargantua und Pantagruel*, 1575.

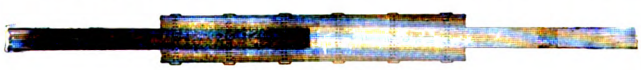
**Fischer,** ERNST KUNO BERTHOLD, Ph.D., b. 1824. Prof. of Philosophy at Jena 1856, and at Heidelberg from 1872. *Hist. Modern Philosophy*, 1852; *Kant*, 1860; *Spinoza*, 1865; *Logic and Metaphysics*, 1865; *Bacon*, 1876; *Lessing*, 1882; *Faust*, 1886; *Schiller*, 1892.

**Fischer,** FRIEDRICH ERNST LUDWIG VON, 1782–1854. Director Botanical Gardens in St. Petersburg. *Enumeratio plantarum novarum*, 1841-42; *Sertum Petropolitanum*, 1846–69.

**Fish,** HAMILTON, LL.D., 1808–1893. M. C. 1843–45; Gov. of N. Y. 1849–51; U. S. Senator 1851–57; Sec. of State 1869–77.—His father, NICHOLAS, 1758–1833, was a revolutionary officer and long Adjt.-gen. of N. Y.

**Fish,** ORDER OF THE. Founded by the Mogul emperors in India, and conferred on certain Englishmen in 19th century.

**Fished Beam.** Two timbers united end to end by a lap or fish joint, one-half of each being cut away for a short dis-



Fished Beam.

tance, and one or both sides of the joint having a short piece of timber bolted thereto.

**Fisher,** or BLACK CAT. See MARTEN.

**Fisher,** GEORGE JACKSON, M.D., b. 1825. Surgeon to N. Y. 7th Brigade 1853–73, and to Sing Sing Prison 1853–54. *Human Monsters*, 1865–68.

**Fisher,** GEORGE PARK, D.D., LL.D., b. 1827. Prof. Yale since 1854. *Life of B. Silliman*, 1866; *Hist. Reformation*, 1873; *Beginnings of Christianity*, 1877; *Hist. Church*, 1888; *Evidences*, 1890; *Colonial History*, 1892.

**Fisher,** JOHN, ab. 1469–1535. Bp. of Rochester 1504, Cardinal 1535; beheaded for opposing Henry VIII.'s supremacy.

**Fisher's Hill,** VA. Here the Union forces under Sheridan routed Confederates under Early, Sept. 22, 1864, taking 1,100 prisoners and 16 guns.

**Fishery.** At Common Law, the right of fishing in private waters was in the owner of the soil, in public waters it was common to all citizens. Modern statutes have variously modified these rules. Fishing by foreigners near the sea coast is generally regulated by treaty, and has given rise to serious international controversies.

**Fishes.** See PISCES.

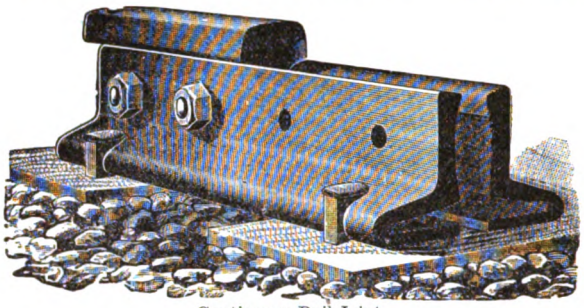
**Fishing Eagle.** See PANDIONES and OSPREY.

**Fish-Glue.** Unrefined isinglass made from fish offal and used for adhesive purposes.

**Fish-Hook.** Bent steel wire with sharp barb and point. Those made in Limerick, Ireland, and Redditch, England, are most highly esteemed. Made of bone, horn, and flint, they have been found of essentially the same form among the earliest evidences of human life on the earth.

**Fish-Lice.** See SIPHONOSTOMATA.

**Fish Plate.** Plate placed upon either side of a joint in order



Continuous Rail Joint.

to strengthen it, as the iron plate used to connect two railroad rails.

**Fish Pond,** or ANGLING. Game in which the players angle for toy fish with a small pole and hook and line. The fish are usually numbered, and count accordingly.

**Fisk,** CLINTON BOWEN, b. 1828. Prohibition candidate for Gov. of N. J. 1886 and for Pres. 1888.

**Fisk,** WILBUR, D.D., 1792–1839. Pres. Wesleyan Univ., Conn., from 1830. *The Calvinistic Controversy*, 1837.

**Fiske,** DANIEL WILLARD, Ph.D., b. 1831. Prof. at Cornell 1868–81.

**Fiske,** JOHN, b. 1842. American author. *Myths*, 1872; *Cosmic Philosophy*, 1874; *Darwinism*, 1879–85; *Idea of God*, 1885; and several valuable books on U. S. history.

**Fisk University.** At Nashville, Tenn., for colored youth, founded 1865, and named for Gen. C. B. Fisk.

**Fissi.** Legs of walking birds, having three toes forward free to their roots, and one backward.

**Fissilinguia.** Sub-order of Lizards, with long thin protrusible and bifid tongues, complete eyelids, and exposed tympanum. The dentition is pleurodont. Here belong the Com-

Wall Lizards (*Lacerta muralis*).

mon Lizard (*Lacerta muralis*) and the viviparous lizard of Europe. They are agile and bright-colored, with oblique rows of rhomboidal scales on the abdomen.

**Fission.** Method of propagation or growth by the division of one individual plant or animal, or of a cell, into two, as in Protozoa, Polyps, some Vermes, and many Bacteria.

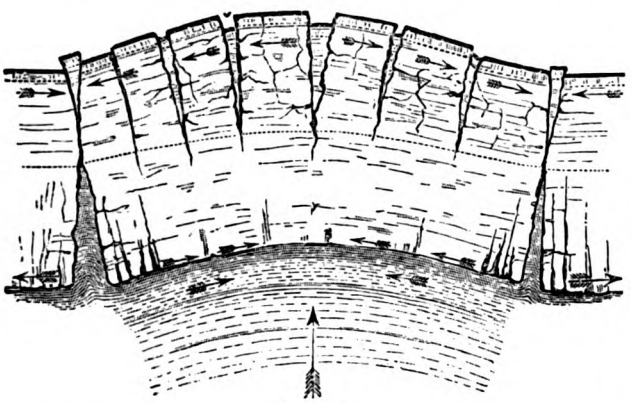
**Fissipalmati.** Legs of swimming birds, having a weblike border to the toes, which is not lobed. They have one posterior and three anterior toes.

**Fissiparous.** Reproducing by fission.

**Fissipedia** (FERÆ). Sub-order of *Carnivora*, including terrestrial forms with toes separated. They fall naturally into three groups: the *Arctoidea* (Bears), *Cynoidea* (Dogs), and *Æluroidea* (Cats). The first group is sometimes classified as *Plantigrada*, the remaining two as *Digitigrada;* or the first two as *Hypomycteri*, the last as *Epimycteri*.

**Fissirostres.** Tribe of Passerine Birds with deeply-cleft beak, short neck, flat head, long, pointed wings, and feet adhamantes or ambulatory. They catch insects on the wing; most live in warm climates. The gape is fringed with vibrissæ to prevent the escape of the insects. Some, like the Swallows (*Hirundo*), are *Oscines*; others, like the Goatsuckers (*Caprimulgus*), are *Clamatores*. The Swifts (*Cypselidæ*), also included, differ from the Swallows in having narrow wings curved like a saber, and feathered metatarsus. The Swallows are distinguished by their long, forked tails and naked metatarsus. See GOATSUCKER.

**Fissure.** Crevice or crack extending across strata which are frequently faulted at the same place. Fissures are the seat



Fissures.

of deposits of various minerals, forming veins or lodes the chemistry and mode of formation of which are exceedingly difficult of explanation.

**Fissurella.** See ZEUGOBRANCHIA.

**Fissure of Anus.** Shallow crack or excavation in the mucous membrane of the anus.

**Fissure-Vein.** Form of ore-deposit in which the mineral matter occupies a crevice previously formed in the country rock. The term is usually restricted to such veins as have an indefinite extension in depth. See GASH-VEIN.

**Fistula.** Small canal or channel in any tissue, formed by the burrowing of pus; termed blind when only one extremity is open; most often a channel connecting the rectum with some point outside of the anus. Operation is the only sure cure.

**Fistularidæ.** See ACANTHOPTERI.

**Fistulose.** Elongated, hollow organs, such as the stems of most grasses and those of many herbs of the Carrot family.

**Fit.** 1. Convulsion. 2. Attack of any disease.

**Fitch,** JOHN, 1743–1798. American inventor, who completed a model of a steamboat with side wheels in 1785; in 1787 placed on the Delaware a boat which made 3 m. an hour, and in 1788 gained a speed of 8 m. an hour. He went to France in 1793, intending to put a steamboat in motion there, but was frustrated by the Revolution. His plans and drawings were for several months in the hands of ROBERT FULTON (q.v.).

**Fitchburg.** City of Worcester co., Mass., on a branch of Nashua R., in a hill country, founded 1720, chartered 1872. It has 3 railroads and some manufactures. Pop., 1890, 22,037.

**Fittig,** RUDOLPH, b. 1835. Prof. of Chemistry at Göttingen, at Tübingen, and since 1876 at Strasburg. *Grundriss der anorganischen Chemie*, 1872.

**Fittings for Pipe.** Those pieces of apparatus which are used to make the joints and outlets in work with wrought iron pipe. They are made of cast or malleable iron. For connecting lengths of pipe with right-hand screw threads, couplings or sockets are short cylinders with female threads, into which the threads on the outside of the pipe are screwed. These couplings are also right-and-left, where two fixed objects are to be coupled. Unions and flanges serve the same purpose. Left threads and unions are used only up to 2 in. diameter. Flanges are not used below 2 in. For coupling a smaller pipe into the fitting of a larger a bushing is used, having a male thread on its outside, to fit the larger size, and a female thread in the smaller hole. Reducing fittings have the same function, one hole being large and the other smaller. Elbows are used to turn corners at 90° and at 45°. Tees and Y's are used where a branch is to leave a line which is also to continue. The branch leaves at 90° from the tee, and at 45° from the Y. Where branches leave on both sides the tie becomes a cross. A nipple is a short piece of pipe. To close an outlet a plug with a male thread may be screwed into a fitting, or a cap with a female thread can be screwed on the end of a pipe. When there can be no spring to admit of using a union or right and left coupling, a lock-nut may be used with a coupling on a long right thread.

**Fitzgerald,** EDWARD, 1809–1883. English translator. His *Rubaiyat* of Omar Khayyam, 1859, is probably the most wonderful reproduction of Oriental poetry in any language. *Letters and Literary Remains*, 3 vols., 1889.

**Fitzgerald,** PERCY HETHERINGTON, b. 1834. Irish novelist, biographer of Sterne 1864, Garrick 1868, the Kembles 1871, Dumas 1872, Lamb 1875–76, George IV. 1881, The Sheridans 1887, Mrs. Clive 1888, and others. *Hist. English Stage*, 1882; *Fatal Zero*, 1888.

**Fitzherbert,** MRS., 1756–1837. Maria Anne Smythe, widow of Col. Fitzherbert, was secretly married to George IV.,

Mrs. Fitzherbert.

then Prince of Wales, in 1785, by whom she was deserted under circumstances of great cruelty aggravated by falsehood 1795.

**Fitzroy,** ROBERT, 1805–1865. English naval officer. He commanded the *Beagle* in a voyage of exploration and survey 1831–36; Darwin was naturalist of the expedition: their *Narrative* was pub. 1839. He was M. P. 1841, Gov. of New Zealand 1843–45; pub. *Meteorological Observations* 1859, and instituted a system of storm-signals.

**Five-Finger.** See CINQUE-FOIL.

**Five Forks.** In Dinwiddie co., Va.; scene of Union victory won by Warren and Sheridan over part of Lee's army, April 1, 1865. Federal loss 1,000; Confederate loss 3,000, and 5,000 prisoners. Gen. Warren, on a charge of disobeying orders, was removed from command.

**Five-Mile Act.** One of the Clarendon Code 1665, forbidding nonconformist ministers to come within 5 m. of any corporation where they had hitherto preached.

**Five-Nations.** Confederacy of Indian tribes of Central N.Y., including Mohawks, Oneidas, Onondagas, Cayugas, and Senecas. They probably settled here, expelling the Shawnees, ab. 1580. Linguistically known as Huron-Iroquois, these Indians warred with all the tribes surrounding them, with whom they had no near relationship. They nearly exterminated the Hurons. A remnant of the Tuscaroras (Huron-Iroquois stock) of N. C. joined the northern Iroquois, who henceforth were "Six Nations." They sided with English in colonial wars, were extensive and successful farmers, and are now on reservations in N. Y., Canada, and Indian Territory.

**Fives.** Ball game popular in France and England from the 14th century. It is a species of hand tennis. A court with two side walls is used and the ball is driven against the wall so as to rebound beyond a line drawn 2 yds. from the wall; the opponent must strike it on the rebound in the same way, and this is kept up till one fails, losing a point; 15 counts game.

**Fivestones.** Common English name of the game known to American children as JACKSTONES (q.v.).

**Fixed Air.** Name given by early chemists to carbonic acid gas in consequence of its occurrence in a fixed form in chalk, marble, and other solid carbonates.

**Fixed Ammunition.** Projectile and charge combined so as to be handled as a unit; now used for rapid-fire and machine guns, and for small-arms.

**Fixed Capital.** Capital which exists in a durable shape and the return to which is spread over a period of corresponding duration. Its most important forms are as machinery, buildings, tools, permanent improvements of land, amount expended in cutting canals, opening mines, and making roads and railroads.

**Fixed Ideas.** Persistent notions impelling to action; found in certain pathological mental conditions where the patient is unable to overcome the impulse, even though convinced that the originating idea is wrong or illusory. These fixed ideas may be trivial or serious, and even homicidal. Such patients are not intellectually deluded; the state seems to be rather a weakness of the voluntary power of inhibiting impulses, a power to which man is largely indebted for his competency to exist as a member of society.

**Fixed Oil.** Oils which cannot be distilled without decomposition, as lard oil, in distinction from volatile oils, as turpentine, which distill unchanged.

**Fixtures.** Chattels so affixed to real estate as to pass with it from one owner to another.

**Flabelliform.** Fan-shaped; leaves of certain palms and other plants.

**Flabellum.** Appendage which carries the gills and is the epipodite of the legs of crabs.

**Flaccus,** CAIUS VALERIUS, d. ab. 88. Roman poet, author of an incomplete epic in eight books, *Argonautica*, recounting the adventures of Jason in search of the Golden Fleece. It has been much praised.

**Flaccus,** MARCUS VERRIUS. Roman grammarian, tutor of the grandsons of Augustus. His important work, *De Verborum Significatu*, survives only in part of an abridgment by FESTUS (q.v.).

**Flaccus,** SICULUS. Roman author of an extant work on surveying, ab. 100.

**Flacius,** MATTHIAS ("ILLYRICUS"), 1520–1575. Pupil of Luther, Prof. Wittenberg 1544–49, Jena 1558–61; noted for an alleged extreme doctrine of original sin; chief author of the *Magdeburg Centuries*, 1559–74, a learned and important Ch. history. *Clavis Scripturæ Sacræ*, 1567.

**Flad,** HENRY, b. 1823 in Bavaria. Civil engineer; member of the Mississippi River Commission 1892; Pres. Am. Soc. of Civil Engineers 1886.

**Flag.** Showy-flowered herbs of the genus *Iris*, natural family *Iridaceæ*, natives of the n. temperate zone.

Flag (*Iris florentina*).

**Flag,** AMERICAN. The first emblem of the federated colonies was adopted by Congress June 14, 1777, thirteen red and white stripes arranged alternately, with a union of thirteen stars, white on a blue field. From May 1, 1795 to July 4, 1818 the flag carried 15 stripes and 15 stars; at the latter date the original number of stripes was restored, but a star was added for each State admitted to the Union. The flags of the army and navy, and of the various divisions and officers, are distinguished by differences in size, form, use of colors, inscriptions, etc.

**Flag Captain.** Captain of that vessel in a squadron selected by the Admiral on which to hoist his flag, hence called the Flagship.

**Flagellants.** Self-scourging fanatics, prominent in Italy and Germany ab. 1261–1420; repeatedly condemned; last tried at Anhalt 1481.

**Flagellarieæ.** Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Monocotyledons*, comprising 3 genera and ab. 6 species, natives of the warm regions of the Old World.

**Flagellata.** *Infusoria*, whose locomotor organs are flagella (cilia may sometimes also be present). These animals are usually small; a few, as *Noctiluca*, are visible to the naked eye. Some form colonies, transitional to the *Metazoa*. They include the LYSSOFLAGELLATES, CHOANOFLAGELLATES, CILIOFLAGELLATES or Dinoflagellates, and CYSTOFLAGELLATES or Rhynchoflagellates (q.v.).

**Flagellate.** Possessing flagellæ, or similar to a flagellum

**Flagellula.** Small flagellated cell, which is destined to lose its flagellum and become a part of a plasmodium.

**Flagellum.** Whiplash-like appendage of protozoan and other cells, used as a locomotor organ chiefly; in fixed forms it serves to direct a stream of water, containing food particles, toward the mouth.—In Botany, also slender branches of vines.

**Flageolet.** Musical instrument "invented" or introduced 1580; revival of the ancient flute. It has six holes, and is not used in orchestras.

**Flagg,** ISAAC, Ph.D., b. 1843. Prof. Cornell 1871–88, and Univ. Cal. since 1891; editor of several Greek classics.

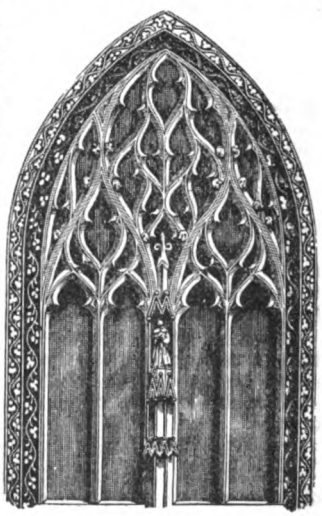
**Flag-Lieutenant.** Species of naval aid-de-camp; one who receives the admiral's commands and transmits them to the other vessels of the fleet.

**Flag-Officer.** Commander of a fleet; Admiral, Vice-admiral, or Rear-admiral. His vessel is the flagship.

**Flag of Truce.** Means of communication between hostile forces in the field; sent toward the enemy's line during a cessation of active hostilities; only in extreme emergency may it be sent during an engagement. Though each party has a right to send it, its reception is customary, not obligatory.

**Flagstone.** Stones, broad and flat, used for sidewalks and curbs; usually a grit or sandstone, which does not split like slate, but separates into layers, a natural stratification. Bluestone found in N. J., N. Y., and Pa., is largely used.

**Flahault de la Billarderie,** AUGUSTE CHARLES JOSEPH, COMTE DE, 1785–1870. French General, ennobled 1813 for services in Spain, in the Russian campaign, and at Leipzig; in exile 1815–27; husband of Baroness Keith and Nairne; Ambassador to Vienna 1841–48, and London 1860–62; Senator 1853.



Window, Harfleur.

**Flamboyant.** In French Gothic architecture a term used to denote the latest phase of the style, in which the tracery, instead of being composed of segments of circles geometrically disposed, follows waving or flame-like lines. Among the richest and most successful examples of flamboyant are those of Rouen.

**Flame.** Is the combustion of a gas, either existing in that form or produced by decomposition by heat, as when wood or coal are burned; heat and generally light are developed by this form of combustion. The flame of a candle has a central zone of gas, produced by the distillation of the paraffin, etc., melted and converted into gas by the heat of combustion; outside this the gas is decomposed, the carbon set free heated white-hot, developing light, and surrounding this the complete combustion takes place, producing heat. See FIRE.

**Flameng,** LÉOPOLD, b. 1831. Belgian-French engraver, called "the illustrious," by Charles Blanc, the greatest of modern French art critics. His best works are figures and portraits. Among his finest plates are *The Countess of Agoul*, *La Source*, *Birth of Venus*, and the *Secret of Love*.—His son, FRANÇOIS, b. 1859, is an eminent painter.

**Flamens.** Priests in ancient Rome; originally 3, afterward 15. The flamines majores were those of Mars, Jupiter, and Romulus, chosen from the patricians; the other 12 might be plebeians. The *F. Dialis* (priest of Jupiter) had a seat in the Senate, the use of a curule chain, and the toga prætexta, with a lictor to attend him; his house was an asylum, and an oath was not required of him.

**Flamingo** (*Phœnicopterus*). Gregarious shore bird of Mediterranean, East Indian, and West Indian regions; essentially a greatly modified Goose; legs and neck very long and

bill abruptly bent downward. It feeds with top of head down, sifting the mud. The color is white, but old birds have crimson

Flamingo (*Phœnicopterus roseus*).

wings. The nests are of mud, on which the birds sit, not stand astride, as reported previous to 1881. Eggs are laid in May.

**Flaminian Way.** Chief road leading n. from Rome to Ariminum; built by C. Flaminius 220 B.C.

**Flamininus,** or **Flaminius,** TITUS QUINTIUS, ab. 230–174 B.C. Roman Consul 198; conqueror of Philip of Macedon at Cynoscephalæ 197; Envoy to Greece 192, and to Prusias of Bithynia 183.

**Flaminius,** CAIUS, d. 217 B.C. Roman Consul 223–217, Censor 220. He marched against Hannibal and was defeated and slain at Lake Trasimenus.

**Flammarion,** CAMILLE, b. 1842. French astronomer, author of sundry popular and widely circulated books. *Plurality of Inhabited Worlds*, 1862; *Imaginary and Real Worlds*, 1864; *God in Nature*, 1866; *Celestial Marvels*, 1865, tr. 1870; *Studies and Lectures*, 9 vols., 1866–81; *Travels in the Air*, 1868, tr. 1871; *The Atmosphere*, 1872, tr. 1873; *Urania*, 1889.

**Flamsteed,** JOHN, 1646–1719. First director of the Greenwich Observatory. Baily dates the beginning of modern astronomy from 1676, when Flamsteed began his observations. *Historia Cœlestis Britannica*, 1723.

**Flanders.** Land of the Flemings. It lay along the North Sea between the Somme and the Scheldt. In 862 Baldwin of the Iron Arm was made Count by the French king; by 1007 his descendants held of the Emperor also. F. was united to Burgundy 1384, and became subject to Austria 1477, though France did not relinquish her claim till 1526. By various treaties Louis XIV. recovered a considerable portion of French Flanders; the rest was assigned to Austria by the treaty of Rastatt 1714. The French conquered it 1794 and held it till the Congress of Vienna, 1814, assigned it to the kingdom of the Netherlands. Since 1831 it has formed two provinces (East and West F.) of Belgium. See BALDWIN, ARTEVELDE, PHILIP THE BOLD, MARY OF BURGUNDY, and PHILIP II.

**Flandrin,** JEAN HIPPOLYTE, 1809–1864. French religious painter. He has frescoes at Paris in the churches of St. Germain des Près, St. Vincent de Paul, and St. Séverin.

**Flange.** Part of a beam, usually at right angles to the web, which takes the principal longitudinal stresses.

**Flank.** Right or left side of a military position or body of troops. It is the weakest part, and the one most likely to be turned by the enemy. When the flank of a body of troops does not rest on some cover or obstacle, it is said to be in the air.

**Flank Angle.** That formed by the flank of the bastion and the curtain, in the bastioned system of fortification.

**Flank Defense.** Means employed in the arrangement of a work, by which its front may be swept by another part of the same work, as in the bastioned, tenailled and polygonal systems.

**Flanked Disposition.** Arrangement of the parts of a fortification, by which some are advanced and some retired from the general front of attack, so that the latter can deliver a cross and flank fire on the enemy as he advances toward the position.

**Flannel.** Soft, nappy, woolen cloth, of loose texture, largely used for blankets and similar goods.

**Flap Amputation.** Method by which the skin is so shaped that it will come over and form a covering for the divided muscles.

**Flashings.** Temporary boards placed upon the crest of a dam to regulate the height of the water.

**Flat.** Musical character, b, which, preceding a note, lowers it half a tone.

**Flat-Fish.** See ANACANTHINI and HETEROSOMATA.

**Flathead Indians.** Chinooks of Washington. They flatten the skull by tying a cushion upon it at birth, and not removing it during the first year. Their slaves are not thus

Flathead (Woman and Child).

treated. The practice does not change the mental character. Their language has sounds not expressible in any alphabet, hence not reduced to writing. They live on fish and roots, are dirty, and are rapidly disappearing.

**Flathead Lake.** In n.w. Montana, on the headwaters of Clark's Fork of the Columbia R. Area 318 sq. miles.

**Flatman,** THOMAS, 1633–ab. 1690. English lyric poet.

**Flat-Rods.** Horizontal or nearly horizontal line of rods, usually of timber, used to transmit power from an engine at a distance to the pumps in a mine-shaft.

**Flattery,** CAPE. N.w. point of Washington.

**Flatulence.** Accumulation of gas in the stomach and intestines, giving rise to more or less distension and pain, and due to fermentation of the food.

**Flat-Worms.** See PLATYHELMINTHS.

**Flaubert,** GUSTAVE, 1821–1880. French novelist. His most important works, *Mme. Bovary*, 1857, and *Salammbo*, 1862, elicited high praise and severe criticism. *L'Education Sentimentale*, 1869; *Trois Contes*, 1877; *Works*, 8 vols., 1885.

**Flavaniline.** $C_{16}H_{14}N_2$. Yellow dye-stuff produced by heating acetanilide with zinc chloride to 250°–270° C.; orange powder, formerly used to dye wool yellow.

**Flavel,** JOHN, ab. 1629–1691. English nonconformist. *Husbandry Spiritualized*, 1669; *Fountain of Life*. His works were collected in 6 vols. 1770, and often reprinted.

**Flavian Amphitheater.** See COLOSSEUM.

**Flavian Cæsars.** Vespasian, Titus, and Domitian.

**Flavianus.** Bp. of Antioch 381–404.

**Flavianus,** ST. Bp. of Constantinople 446, deposed and beaten to death by the Eutychian party in the Robber Council of Ephesus 449.

**Flavine.** Impure quercetin; yellow dye-stuff, soluble in water, prepared from quercitron bark; used in wool-dyeing.

**Flavo Purpurin.** $C_{14}H_5O_2(OH)_3$. Trioxyanthraquinone, sold in trade under the name Alizarine, of yellowish shade; made from anthraquinone, disulphonic acid, potassium chlorate and caustic soda; yellow substance, insoluble in water and used like ALIZARINE (q.v.).

**Flax.** *Linum usitatissimum*. Important fiber-plant of the natural family *Linaceæ*, native of Europe, introduced by culti-

vation into N. America. Linseed oil is obtained from the seeds. In the U. S. flax is almost always grown solely for the seed. It

Flax (Linum usitatissimum).

is most largely grown in the West, where it is sown broadcast in the spring of the year and pulled as for wheat or oats. It is harvested and threshed by machinery, and only the seed used.

**Flax.** False. *Camelina sativa.* Plant of the Mustard family, native of Europe, a weed in flax fields, introduced into N. America; also known as Gold of Pleasure.

**Flaxman,** John. 1755–1826. Leading English representative of the Greek Revival style in monumental sculpture. R. A. 1800. Prof. Sculpture to R. A. 1810. His illustrations to the *Iliad* and *Odyssey*, 1793, are famous.

**Flea.** See Pulicidæ.

**Fleabane.** Herbs of the genus *Erigeron*, natural family *Compositæ*, of wide geographical distribution.

**Fleabane,** Marsh. Plants of the genus *Pluchea*, marsh herbs of the Composite family, natives of N. and S. America.

**Flea-Beetles.** *Phyllotreta vittata.* Chrysomelid, 3 long, shining black with wavy yellow lines on sides. Injurious to young plants, also to the foliage of full-grown plants. Asphaltum, lime, tobacco-decoction, etc., are used to destroy them.

**Flèche.** In Gothic Architecture, the French name for a spire, and applied to small spires, usually over the rood loft of the cathedrals of the Middle Ages, but also to those of the transepts of Amiens, and to Notre Dame and the Sainte Chapelle at Paris.

**Flèches d'Amour.** Quartz pebbles, or rounded crystals of quartz.

**Flechier,** Esprit. 1632–1710. Bp. of Nîmes 1687; noted pulpit orator.

**Fleckeisen,** Alfred. b. 1820. German editor of Plautus and Tacitus.

**Flecknoe,** Richard. d. 1678. Irish poet, whose satire suggested the title to Dryden's satire, *Mac Flecknoe.*

**Fleet.** Prison in London from the twelfth century, burned 1780, and 1780; used as debtors' prison 1641–1842; demolished 1846.

**Fleet Marriages.** Contracted by clergymen confined for debt, mostly in the 18th century, especially during the Commonwealth. In the days

Fleet Wedding, from a Contemporary Print.

before the Act which had effect, 217 marriages were entered in a single register.

**Fleetwood,** John. Name appended to a highly popular *Life of Christ*, 1767, and to two other books, 1772–73. Nothing is known of the author.

**Flegel,** Eduard Robert. 1855–1886. Russian explorer in Africa.

**Fleischer,** Heinrich Leberecht. 1801–1888. Prof. Leipzig 1836; ed. Abulfeda's *Historia Moslemica*, 1831–34, and other Arabic and Persian works.

**Fleming,** John. 1785–1857. Prof. Aberdeen 1832–43, and New College, Edinburgh, from 1845. *Philosophy of Zoology*, 1822; *Hist. British Animals*, 1828; *Molluscous Animals*, 1837.

**Fleming,** Paul. 1609–1640. German lyric poet.

**Fleming,** Sandford. LL.D., b. 1827 in Scotland. Canadian engineer, surveyor of the Red River and other western regions; chancellor of Queen's Univ. 1880. *England as I Canada*, 1884.

**Flemish.** Low German dialect, spoken in Flanders, and now rapidly losing ground, but now important for its literature. What is now called Flemish, and has produced of late considerable literature, is really the Dutch of Belgium, as distinguished from the Dutch of Holland. See Dutch.

**Flemish School of Painting.** See Van Eycks, Hans Memling, Roger Van der Weyden, Quentin Matsys, Rubens, Van Dyck.

**Flemming,** Walther. b. 1843. German anatomist, Prof. Kiel 1876.

**Flesh.** The soft structures of the bodies, particularly the muscles and fat pertaining to them.

**Fletcher,** Andrew, of Saltoun. 1655–1716. Scottish patriot. He took part in Monmouth's rebellion 1685, was in exile to 1688, and opposed the union with England. *Political Works*, 1737.

**Fletcher,** Giles. 1588–1623. English poet, brother of Phineas (q.v.). He wrote *Christ's Victory and Triumph*, 1610, a poem which influenced Milton.

**Fletcher,** John. 1579–1625. English dramatist, associated with Francis Beaumont; author, in part or whole, of 52 plays, usually ranked next in merit to Shakespeare's.

John Fletcher.

**Fletcher, or de la Flechère,** John William. 1729–1785. Swiss, settled in England 1757. Vicar of Madeley 1760; eminent champion of Methodism. *Five Letters to Antinomianism*, 1771. His works, collected 1803, 2 vols.

**Fletcher,** Phineas. 1582–1650. English poet, cousin of the dramatist. His *Purple Island*, 1633, is an elaborate allegory.

**Fletcher,** Robert, M.D., b. 1823. Prof. Columbia Univ.; author on anthropology.

**Fleur-de-Lis.** Iris germanica. Large white Iris, native of Europe; bearing emblem of the French crown. The three petals of the fleur-de-lis have been said to typify the Trinity. Many curious legends are related as to the origin of the emblem.

**Fleurus.** Town of Belgium; site of battle, Aug. 29, 1622; victory of Spanish under the Duke of Brunswick and Saxe-Weimar; of defeat of Walenstein by Marshal Luxembourg, July 2, 1690; of a French victory of the Austrians under Prince of Coburg over Jourdan, June 26, 1794. Pop., 1901, 8,148.

**Fleury,** André Hercule de. 1653–1743. Bp. of Frejus 1698; tutor of Louis XV. 1715; Archbishop 1715; Prime Minister and Cardinal 1726. His intentions were good; his capacity for affairs was small.

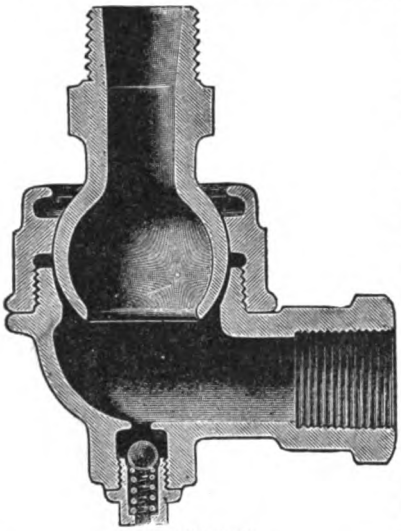
**Fleury,** Claude. 1640–1723. Tutor to several French princes, Prince Augustus, Abbé 1696, and confessor to Louis XV. His *Church Hist.*, 20 vols., 1691–1723, is still esteemed.

**Fleury,** Emile Félix. 1815–1884. French General; Envoy to Russia 1868–71.

**Fleury,** Jules François Félix Husson (Champfleury). 1821–1889. French novelist and writer on pottery.

**Flexibility.** Property of a rod or strip of material of which it may be bent from its normal shape without fracture. During flexure the fibres of the convex side are compressed, and those of the concave side extended.

**Flexible Joint.** Joint in a pipe so arranged that the adjacent parts can be turned or moved with respect to each other.



Flexible Joint.

**Flexible Sandstone.** See ITACOLUMITE.

**Flexible Shaft.** Pliable power transmitter. Coil of steel wire is overwound with another spiral in a reverse direction, this by a third and so on. The ends of the wires are brazed and the whole covered with a hose. Its uses are numerous.

**Flexion.** Bending of parts so as to form an angle with each other, as when the fingers are inclined toward the palm of the hand. Muscles having this action are termed flexis.

**Flexure** OF BEAMS. Straining or bending of beams by loads acting at right angles to their length; first investigated by Galileo 1638. The strength of a rectangular beam varies directly as its breadth, directly as the square of its depth, and inversely as its length. The stiffness varies directly as its breadth, directly as the cube of its depth, and inversely as the cube of its length. When the beam is flexed, the fibers on the concave side are compressed and those on the convex side are extended. See BEAM and BEAMS, DEFLECTION OF.

**Fliedner,** THEODOR, D.D., 1800–1864. Pastor at Kaiserswerth, near Düsseldorf, from 1821; founder there of the house and order of Deaconesses 1836, and of its adjuncts, an infant school, orphans' home, hospital, and insane asylum. By 1890 Germany had 60 similar houses, with 6,000 deaconesses.

**Fliers.** Straight flight of steps.

**Flies.** See DIPTERA.

**Flight in Animals,** POWER OF. Power of flight has apparently been evolved easily and independently in very different groups of animals. The lowest expression of this power is seen in the cases where a balloon-like support is made; *e.g.*, Spiders, which are transported clinging to their threads. The next step is seen in animals having expanded surfaces on which they glide, as certain water-fleas among Crustacea, Flying Fishes, Flying Dragon among Reptiles, and Flying Squirrel among Mammals. True flight is attained by myriads of insects, in which the wings are modified gills, by birds where the production of quills on the fore limbs form the wings; and among Reptiles (Pterodactyl) and Mammals (Bats), a web of skin between greatly elongated fingers and between the fore and hind limbs along the sides of the body. It is ignorance of the mechanics of flight, now being cleared away, and inexperience in the use of a flying apparatus, that has hitherto kept man from navigating the air, except by floating.

**Flinders,** MATTHEW, 1774–1814. English explorer of the Australian coast 1795–1803. *Voyage to Terra Australis*, 1814.

**Flint.** Amorphous, impure variety of quartz, usually light-colored, translucent on the edges, and frequently of organic origin.

**Flint,** AUSTIN, M.D., LL.D., 1812–1886. Prof. Buffalo, N.Y., 1847–53, New Orleans 1858–61, and Bellevue Hospital, New York, from 1861; Pres. N. Y. Academy of Medicine 1872–85; author of *Principles and Practice of Medicine*, 1866, and other professional works.—His son, AUSTIN, M.D., b. 1836, became prof. at Bellevue Hospital 1861 and Surgeon-gen. of N. Y. 1874. *Physiology of Man*, 5 vols., 1866–74.

**Flint,** CHARLES LOUIS, 1824–1889. Sec. Mass. Board of Agriculture 1853–81. *Grasses and Forage Plants*, 1857; *Milch Cows and Dairy Farming*, 1859.

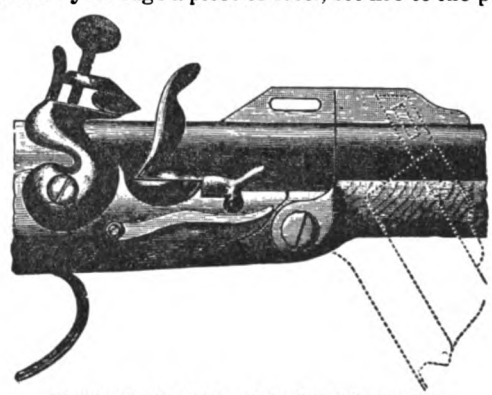
**Flint,** ROBERT, D.D., LL.D., b. 1837. Prof. St. Andrews 1864, Edinburgh 1876. *Theism*, 1876; *Anti-theistic Theories*, 1877.

**Flint Glass.** Glass of high specific gravity, low melting point, and high refractive index; used for the manufacture of lenses; made by melting together silica 10, potassium carbonate 3, and red lead 10 parts. Ordinary flint glass is made from silica 200, soda ash 60, litharge 60, niter 16, and lime 12 parts. It is used for ordinary table utensils. Crystal glass is a fine quality of flint glass. It is easily cut, and its high refractive power of light renders it brilliant. Achromatic lenses are the combination of a lense of flint glass and one of crown glass. See ACHROMATIC OBJECT-GLASS.

**Flint Implements.** Earliest trustworthy evidence of human life on the earth, found in caves and alluvial deposits, accompanied with the remains of animals both extinct and extant. They consist of spear-, arrow-, and ax-heads. See ANTHROPOLOGY and ANTIQUITY OF MAN.

Flint Implements.

**Flintlock.** Old device, now obsolete, for communicating fire to the musket charge. The flint was firmly clamped in the jaws of a firing hammer, so that when released by the trigger it would strike by its edge a piece of steel, set fire to the powder in a pan, and thus by way of the vent explode the powder of the cartridge in the barrel of the gun. A Scotch clergyman, Forsyth, patented in 1807 the priming with fulminating powder, but the mechanism of firearms was not revolutionized till 1834.



French Flintlock Breech-loader, 18th century.

**Floating Cartilage.** Hard body sometimes found in a joint; most common in the knee-joint, where it is frequently caught between the bones, causing severe pain.

**Floating Heart.** Aquatic plants of the genus *Limnanthemum*, natural family *Gentianaceæ*, bearing floating, heart-shaped leaves, natives of e. N. America.

**Floating Ribs.** The two lower ribs.

**Floating Tumors.** Freely movable tumors in the abdomen; usually organs which lack their natural attachments.

**Float of Clouds.** Height at which clouds float.

**Float Ore.** Fragments of ore, found on or near the surface, that by natural causes have been carried to some distance from the main body of the deposit.

**Floats.** Pieces of wood, cans, or barrels, used to float with the current of a river and thus to measure its velocity.

**Floccose.** Surfaces of leaves or other organs when covered with interwoven hairs which fall away in patches.

**Floccus.** Tuft of hair on end of the tail in mammals.

**Flodden Field.** In Northumberland; site of battle between English and Scots, Sept. 9, 1513. James IV. of Scotland was slain with many nobles and more than 10,000 men.

**Flodoard,** or FRODOARD, 894–966. Canon of Rheims; author of *Annales*, 919–966, edited 1854.

**Flogging.** Punishment formerly common under most governments and in various shapes; now little used in civilized lands; abolished in British army and navy 1881. It is still used in Delaware.

**Flood.** In Genesis, catastrophe, which destroyed mankind and all terrestrial life, except such as was saved with Noah

Flood (by Paolo Uccello, 1397–1475).

and his family in the Ark. The relation of this tradition to actual history is variously debated among scholars.

**Flood,** HENRY, 1732–1791. Irish orator, M.P. 1783. *Speeches*, 1787.

**Flood Discharge.** The total discharge of rivers in times of flood increases with the watershed, but the discharge per sq. mile diminishes. For a watershed of 100 sq. miles the total flood discharge is ab. 9,000 cubic feet per second, while for one of 1,000 sq. miles it is ab. 63,000, the discharge per sq. mile being 90 and 63 cubic feet per second respectively.

**Floodgate.** Gate in a dam which is to be opened in times of flood to regulate the height of the water. A tidal floodgate is one which closes as the tide rises, while it opens as the tide falls, to allow the drainage of the country behind it.

**Flooding.** Severe hæmorrhage from the uterus.

**Floods.** Inundations caused by the bursting of dams, overflow of rivers, and volcanic disturbances, have been numerous and universal. In England 3,000 perished 353, many seaports were destroyed 1014, and the Goodwin sands were formed by sea-encroachments 1100. The Low Countries have suffered most from the sea. Flanders was inundated and Ostend immersed 1108, the Texel submerged 1400, Dort and 100,000 people overwhelmed 1421, the dikes broke and 400,000 died 1530, Zealand lost 1,300, 1717, besides many smaller catastrophes. Catalonia, Spain, lost 50,000, 1617; Madrid suffered 1723; Navarre (2,000) 1787; and Lorca, Mercia (1,000), 1802. In 1813, 2,000 Turkish soldiers perished in the Danube at Widdin, and in Poland and Silesia 10,000 inhabitants were drowned. Other big floods of the century were at Danzic 1829, Vienna 1830, Canton 1833, France generally 1840 and 1846, India 1875, and Hungary 1879. At Johnstown, Pa., by the bursting of a dam, 1889, 5,000 perished.

**Floor.** In Mining, (1) stratum underlying a bed of coal or ore; (2) flat portions of rock traversed by small metalliferous veins; *e.g.*, the "tin floors" of Cornwall.

**Floor Beam.** Beam supported by the trusses of a bridge and carrying the floor. Floor beams in iron bridges are usually plate girders, formed by riveting angle irons to a vertical plate. To them are attached longitudinal stringers upon which the floor is directly supported.

**Floquet,** CHARLES THOMAS, 1828–1896. French Deputy 1871; Prime Minister 1888–89. He wounded Boulanger in a duel 1888, and was involved in the Panama scandal 1892.

**Flora.** Roman goddess of flowers and spring; identified with Chloris, wife of Zephyrus.

**Flora.** Total plant population of a region; also treatise describing it.

**Florence.** City of Italy, on the Arno; famous for its beauty, its galleries of painting and statuary, its cathedral and numerous other churches, the Campanile of 1320, its bridges and public squares, the national library and museum, palaces and monuments, and countless works of art. It was the birthplace of Dante, the home of Boccaccio, of Da Vinci, Michelangelo, Raphael, and a host of artists; the center of art and literature for the nation. From 1113 till 1530 it was a republic. There were fierce contentions here between the Guelphs and Ghibellines in the 13th century. The Medici bore sway with some interruptions from 1434 to 1737. It was the capital of Tuscany from 1569, and of Italy 1864–71. In 1348 it lost 100,000 inhabitants by the Black Death. The famous Dome of the cathedral, 138½ ft. in diameter at base and 387 above the pavement at the apex of the lantern, is the work of Brunelleschi,

Florence, from San Miniato.

and was finished 1446. The Church of San Lorenzo contains Angelo's masterpieces, his *Day and Night* and *Twilight and Morning*. The chief art galleries are the Uffizi, Pitti Palace and Florence Academy. Pop., 1893, 197,500.

**Florence,** COUNCIL OF. 1439–42; adjourned from BASEL (q.v.) 1431, and Ferrara 1438.

**Florence** OF WORCESTER, d. 1118. English chronicler. His work, tr. 1847, is of value from ab. 1030.

**Florence,** WILLIAM JERMYN, 1831–1891. American actor.

**Florencia,** FRANCISCO DE, 1620–1695. Spanish Jesuit, historian of the order in Mexico.

**Florentine Academy.** Founded 1540, succeeding the della Crusca.

**Flores,** JUAN JOSÉ, 1800–1864. Pres. Ecuador 1830–35, 1839, and 1843–45.—His son, ANTONIO, has been Minister to the U. S., France, and England, and was Pres. 1888–92.

**Flores,** VENANCIO, 1809–1868. Pres. of Uruguay 1854–55 and 1866–68.

**Florescence.** See ANTHESIS.

**Flores Zinci,** or PHILOSOPHER'S WOOL. Zinc oxide formed in a very finely divided condition when zinc is burned.

**Florets.** Individual flowers in the inflorescence of the Composite family.

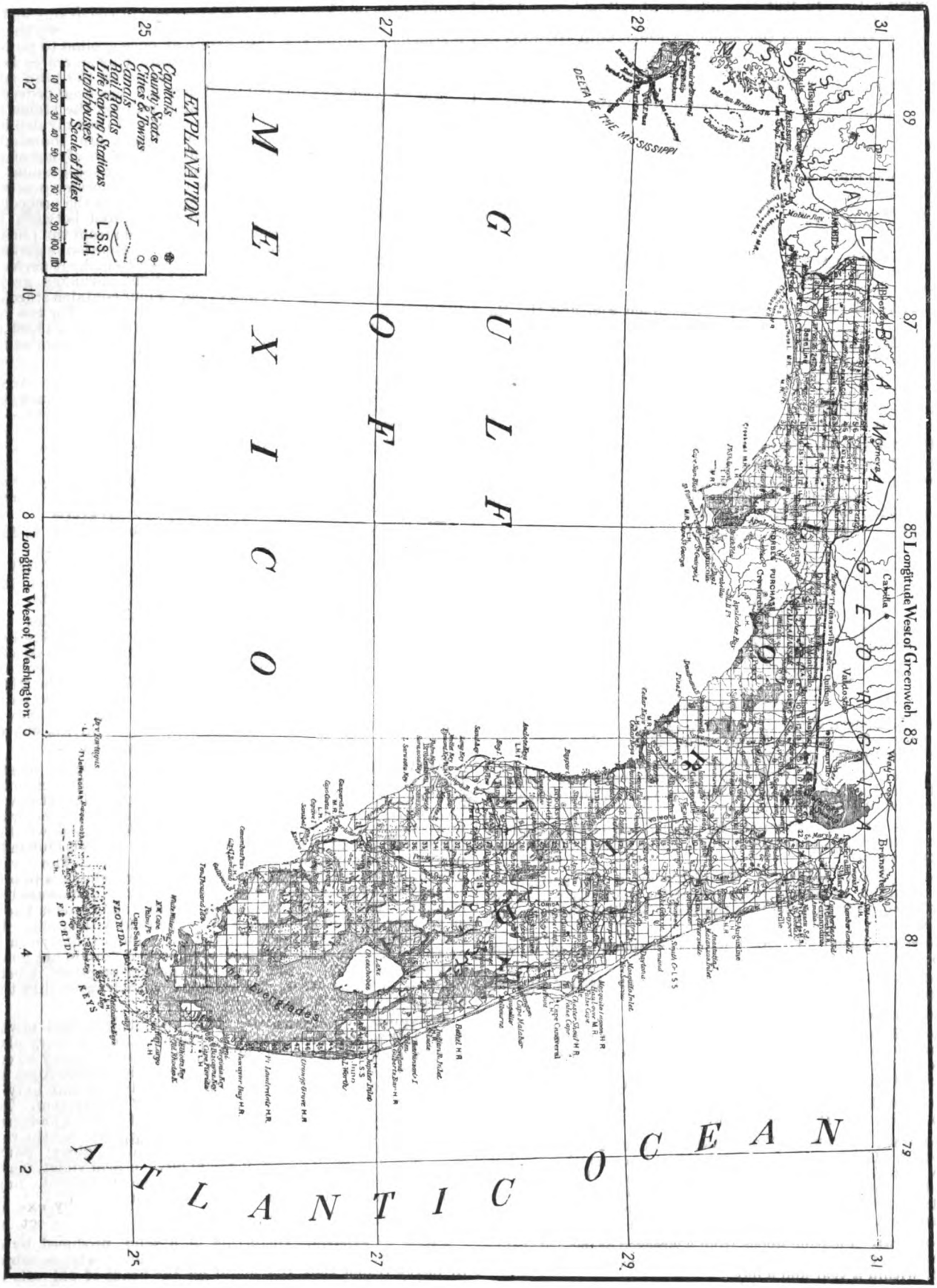
**Florian.** Roman Emperor April–July 276; brother and successor of Tacitus.

**Florian,** ST. Martyr ab. 300, patron of Poland. His day is May 4.

**Florian,** JEAN PIERRE CLARIS DE, 1755–1794. French dramatist, novelist, poet, and tr. of *Don Quixote;* Academician 1788. *Galatea*, 1782. His *Numa Pompilius* caused his arrest during the Reign of Terror. He is perhaps best remembered by his *Fables*, 1792.

**Floriculture.** Under the ancient monarchies and republics the love of flowers and their extensive use on all festive and ceremonial occasions was universal. In Egypt, Babylon, Greece, and Rome, floriculture was an important industry, and in the Middle Ages the East was constantly supplying Europe with new varieties of flowers. The Dutch in the 17th and 18th centuries controlled the European trade, especially in tulips. Though the flower-garden in the U. S. is not so important as in Europe, yet the industry in 1891 gave employment to 18,805 people who raised 240,272,417 plants and flowers valued at $26,211,805.77.

**Florida.** Southeasternmost State of the U. S. It is mainly a peninsula, separating the Gulf of Mexico from the Atlantic, with a narrow strip running w. along the s. border of Ga. and Ala. Its area is 58,680 sq. m. Though the surface of F. is covered with lakes, it has few rivers. Most of these lakes are fed by springs and have no superficial outlets. The surface is extremely level. The greatest elevation hardly exceeds 200 feet, while its average elevation is less than 100 feet. The geological structure is simple. Around the entire peninsula and extending along the shores elsewhere is a belt of Quarternary formations. This is succeeded on the Atlantic side by Neocene, while over the rest of the State Eocene formations are found. The industries are almost entirely agricultural. Cotton, tobac-


EXPLANATION
Capitals
County Seats
Cities & Towns
Canals
Rail Roads
Life Saving Stations L.S.S.
Lighthouses L.H.
Scale of Miles
10 20 30 40 50 60 70 80 90 100 110
GULF OF MEXICO
ATLANTIC OCEAN
DELTA OF THE MISSISSIPPI
Everglades
FLORIDA
KEYS
85 Longitude West of Greenwich, 83
8 Longitude West of Washington 6

co, fruits, and vegetables are the principal crops. In 1890 the area of improved land was 1,145,693 acres and the agricultural product was valued 1889 at $12,086,330. The cotton crop, 1894, was 48,005 bales. In 1891 the mileage of railroads was 2,537. F. was discovered 1513 by Ponce de Leon, on Easter Sunday (*Pascua Florida*), hence the name. Unsuccessful attempts at colonization were made by him, and later by others; the first permanent colony was planted at St. Augustine by Aviles de Menendez 1565, after the massacre of the Huguenots, who had already got a footing there and built a fort. St. Augustine is thus the oldest European town in N. America. F. was ceded to England in exchange for Cuba 1762, but re-ceded to Spain 1783, when some 20,000 English settlers removed to adjoining provinces. It was ceded to the U. S. in 1821 and organized as a territory in 1822. Settlers began to flow in, but its prosperity was checked for a time by a seven years' war with the Seminoles, who were nearly all removed to the w. of the Mississippi after its close in 1842. The State was admitted to the Union 1845, and seceded 1861, readmitted 1868. The capital is Tallahassee, in the n.; the chief towns are Key West, Jacksonville and Pensacola. Pop., 1890, 391,422, 67 to the sq. mile; nearly half are colored. (See Map on page 159.)

**Florida,** STRAITS OF. Passage between Fla. and the Bahamas.

**Florida Agricultural College.** At Lake City; organized 1884. It has 10 instructors; offers courses in arts, agriculture, mechanics, and civil engineering; has a military department, and an experimental farm.

**Florida Blanca,** JOSÉ MONINO, COUNT OF, 1728–1808. Prime Minister of Spain 1778–92.

**Florida Keys.** Series of islets off the s. end of Florida.

**Florideæ.** Large sub-class or order of *Algæ*, including all the red, pink and purple kinds, mainly inhabiting the sea, a very few species being found in fresh water; also known as *Rhodosporeæ*, *Rhodophyceæ*, and *Rhodospermeæ*.

**Florin.** 1. Florentine mediæval coin, struck in gold and

Gold Florin, ab. 1430.

silver. 2. Modern silver Dutch coin (gulden or guilder), value 40.2 cents. 3. Austrian florin, value 48.6 cents. 4. English two-shilling piece, since 1849.

**Florio,** JOHN, ab. 1553–1625. Son of Italian refugees in London; author of an Italian dictionary, 1598, and of a good translation of Montaigne 1603.

**Floris,** or **De Vriendt,** FRANÇOIS, 1520–1570. Flemish painter, important as representing the rise of Italian influence on northern art.

**Floris,** FRANZ, 1517–1570. Flemish painter. An artist of no high rank, but exceedingly significant for the history of art in its next period as representing the rise of Italian influence on Northern painting.

**Florus,** 2d century. Author of a compendium of Roman history to 20 A.D., based on Livy.

**Florus,** 9th century. Deacon at Lyons, writer against Erigena.

**Flosculous.** Bearing florets.

**Flos Ferri.** "Flowers of iron"; variety of aragonite (rhombic calcium carbonate), occurring in snow-white, branching, coralloidal forms. It has been found in beautiful shapes, associated with the iron ore siderite, in the mines of Styria.

**Floss Silk.** Residue adhering to the cocoon when no more can be reeled off. It is specially prepared for use in needle-work.

**Flotow,** FRIEDRICH FERDINAND ADOLPH, FREIHERR VON, 1812–1883. German opera composer, best known by his masterpiece, *Martha*, 1847. Other works still heard, though rarely outside of Germany, are *Allessandro Stradella*, 1844, and *L'Ombre*, 1870. His music is characterized by tunefulness and grace rather French than German. He studied in France.

**Flotsam.** Floating goods from a wrecked or imperiled ship belonged to the crown by common law, unless claimed by the owner within a year and a day.

**Flounder.** See ANACANTHINI and HETEROSOMATA.

**Flour.** Powder produced by grinding wheat. Good flour should have a slightly yellowish color, smooth feel, fresh clean odor, and when compressed in the hand should cling together as loose cake. The object to be accomplished in milling wheat is (1) to free the grain from the coverings of woody fiber; (2) to remove the oily germ near the lower end of the grain; and (3) to reduce the central portion of the wheat to flour. By the old method of milling the grains were at once ground to powder between mill stones and the bran separated by sieves or bolts of cloth. Graham supposed that by retaining the bran additional nourishment was obtained, but this has been proved to be false. By the new method or high milling, the stones are slightly separated and the grain crushed and then divided into flour, middlings and bran. The middlings are thoroughly cleaned and ground into patent flour. The purifying of the middlings is the vital part of the process. By the gradual reduction process the grain passes through successive sets of rollers, each set adjusted nearer together than the preceding, and the flour, bran and middlings separated between the grindings. The finest grade of flour is made from the purified middlings of the last reduction. Much attention is given to the wheat before it is passed into the rolls to make it perfectly clean and free it from impurities and light shrunken grains. In some mills it is washed and dried. Flour contains starch 70 per cent, albuminoids 12, fat 1, fiber 0.2, ash 0.5. For the year ending June 30, 1895, there was exported from U. S. 15,268,892 bbls. of wheat flour valued at $51,651,928. The average annual yield of U. S. is ab. 80,000,000 bbls. See ROLLER MILL.

**Flourens,** MARIE JEAN PIERRE, M.D., 1794–1867. Academician 1840, peer of France 1846, prof. Coll. of France 1855. *Buffon*, 1844; *Formation of Bones*, 1847; *Physiology*, 1854.—His son, GUSTAVE, 1838–1871, pub. *Science de l'Homme*, 1865, and other books, and fought in Crete and for the Parisian Commune.

**Flower.** Primary reproductive organ of the *Spermatophyta*. It consists of vegetative organs, mainly leaves metamorphosed into the several portions of the structure.

**Flower,** ROSWELL PETTIBONE, LL.D., b. 1835. M. C. 1881–83 and 1889–91; Gov. of N. Y. 1892–94.

**Flower,** SIR WILLIAM HENRY, LL.D., D.C.L., F.R.S., b. 1831. Prof. London 1870–86; Pres. British Association 1889. *Nerves*, 1861; *Osteology of Mammalia; The Horse*, 1892.

**Flowers,** ARTIFICIAL. Exceedingly ancient examples exist. Egyptian tombs have yielded flowers made of painted linen and horn. The Chinese used bamboo-pith, various Asiatics made them of feathers as the Brazilians do at the present day, and gold and silver flowers were made in Rome. In the Middle Ages, Italy produced beautiful specimens of satin, silk, paper, wax, and various metals. The manufacture of artificial flowers now forms an important industry in most countries, but the French do the best work and export large quantities.

**Flowers,** COLORS OF. The coloring principles of most of the vegetable dye-stuffs have been isolated, and their chemical relations and compositions established, yet the colors of flowers have so far resisted all attempts at isolation. The colors of flowers vary much during their existence; the same flower having several colors in the same day. Garden phlox is blue in the early morning and pink in the middle of the day. The forget-me-not opens with a yellow tint, which soon changes to blue. In only a few cases have the coloring matter of flowers been isolated. The coloring matter of the saffron crocus is known as polychroite and is supposed to be identical with crocin. The red coloring principle of safflower is an important dye called carthamin. The blue and red pigments of flowers are generally soluble in water, the yellow in alcohol or ether, it being resinous in many cases. On account of their instability they are of little value in dyeing.

**Flowers,** LANGUAGE OF. Floral symbolism has always flourished in the East, where the signification of every plant is universally understood and a lengthy dispatch may be conveyed by a small bouquet; and Europe in the Middle Ages was versed in similar flower-lore. Much early art can only be rightly comprehended by a knowledge of the system. This symbolism gave rise to the flower badges of nations and great families. Some of the commonest meanings are: for the rose, love and beauty; broom, humility; laurel, glory; pansy, thoughts; lily, purity; poppy, sleep; olive, peace; violet, fealty; rosemary, remembrance; daisy, innocence; almond, hope; asphodel, death; and amaranth, immortality.

**Flowers of Sulphur.** See SULPHUR.

**Flow of Solids.** Distortion of a solid, produced by excessive stress. It may be seen on the rails of a track subject to heavy traffic that the metal on the heads of old rails has flowed in a direction away from the center of the track, forming a burr or lip on the outer side of the head. In cold punched steel bolt nuts, half the metal from the hole is forced into the body, the other half being punched out.

**Flow Through an Orifice.** Experiment has shown that when an orifice is made in the thin wall of a vessel containing a fluid, the fluid vein is constricted just outside the vessel, so that the actual fluid section is only ab. 62 per cent of the area of the hole in a dense fluid like water, and ab. 80 per cent in a tenuous one. A conoidal nozzle, properly shaped to the profile of the vena contracta, will give the full rendition of the area of its least section. This investigation is due to Eytelwein.

**Floyd,** JOHN BUCHANAN, 1807–1863. M. C. 1847–49; Gov. of Va. 1850–53; Sec. of War 1857–60. He used his power in the interests of the South, in view of the impending conflict, by scattering the army and transferring arms and ammunition to Southern arsenals, and resigned when Pres. Buchanan refused to withdraw the U. S. troops from Charleston harbor.

**Floyd,** WILLIAM, 1734–1821. Signer of the Declaration of Independence; M. C. from N. Y. 1789–91.

**Floyer,** SIR JOHN, 1649–1734. Physician at Lichfield; translator of *The Sibylline Oracles*, 1713.

**Flucan,** or FLUCCAN. Vein filled with clay, or clayey portion in a vein of ore.

**Fludd,** ROBERT, 1574–1637. English theosophist, author of mystical works in Latin.

**Flüe,** NIKLAUS, 1417–1487. Swiss hermit, of great fame and influence on national affairs.

**Flue Boiler.** Form of boiler in which there are one, two, three, five, or seven large cylindrical flues or gas-ducts passing through the water space of the boiler. The water surrounds these flues on the outside, and the hot gases pass through inside. Such boilers are suitable for flaming fuels, or gas, and for localities where the water deposits scale. The flues are either of lap-welded tube, or of riveted plate. They are secured to the heads by being riveted to flanges made on the latter.

**Flügel,** GUSTAV LEBRECHT, 1802–1870. Prof. Meissen 1832–50; ed. *Koran* and other Arabic works. *History of the Arabs*, 1833.

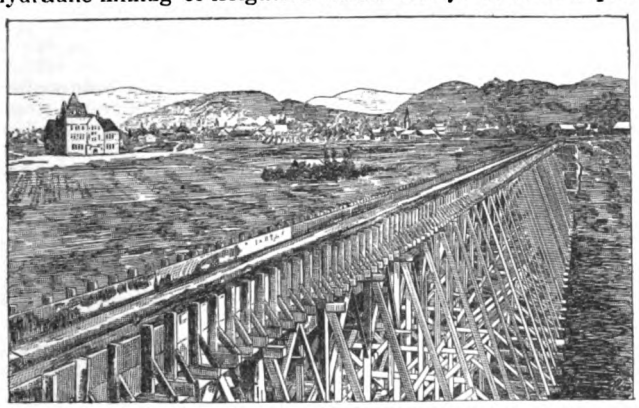
**Flügel,** JOHANN GOTTFRIED, 1788–1855. Prof. Leipsic 1824–38. *English-German Dictionary*, 1830; *Merchants' Dictionary*, 1840.

**Fluids.** Bodies which possess no elasticity of form. Liquids and gases are fluids, and as they require no force to keep them in any particular shape, they exercise no permanent resistance to a change of shape. According to Maxwell, a fluid is a body the contiguous parts of which act on one another with a pressure which is perpendicular to the interface which separates those parts. While this may be true in the case of many fluids when at rest, it is never strictly so when the body is in motion. We have then no perfect fluids; in other words, there is always some degree of viscosity.

**Fluitant.** Floating plants or parts of plants.

**Flukes.** See TREMATODA.

**Flume.** Trough or artificial channel which carries water from a reservoir to a wheel; structure built to carry water for hydraulic mining or irrigation across valleys or other depressions of the surface. Many remarkable instances of expensive flume-building are to be seen in the hydraulic mining region of California.



Flume connecting with Main Irrigation Canal, Riverside, Cal.

**Fluoborates.** Salts of fluoboric acid.

**Fluoboric Acid.** $H_2B_2O_4{:}6HF$. Made by dissolving $H_3BO_3$ in concentrated aqueous HF and concentrating the solution. Thick syrupy liquid; it is doubtful if it is a definite compound. It chars organic matter like sulphuric acid.

**Fluorene.** $C_{13}H_{10}$. Mpt. 113° C. Diphenylene methane. Crystallized from hot alcohol in colorless leaflets, showing a violet fluorescence; found in coal-tar.

**Fluorescein.** $C_{20}H_{12}O_5$. Resorcinphthalein; substance prepared by heating phthalic anhydride with resorcin to 200° C.; red powder, soluble in alkalies and alcohol, imparting a wonderful fluorescence to the solution. By the action of bromine, chlorine, and iodine, it furnishes the magnificent red coloring matters known as the eosins.

**Fluorescence.** Prof. Stokes discovered that certain substances had the power of absorbing invisible rays of high refrangibility and correspondingly short wave-length, and of emitting these rays so far lowered in refrangibility as to be luminous. This phenomenon he called fluorescence. By the application of this principle it has been made possible to render visible the ultra-violet parts of the solar spectrum, the waves of which under normal conditions are too short to affect the eye. If this invisible part of the spectrum be thrown upon a screen freshly washed with sulphate of quinine, it will become visibly bluish, and if the spectrum be very pure the character and position of the dark lines in this portion may be studied.

**Fluorides.** Derivatives of hydrofluoric acid, HF, or compounds resulting from the union of fluorine with some other element.

**Fluorine.** F or Fl. At. wt. 19. Isolated first by Moissan 1886, from HF, in which Ampère declared its existence 1810. Its chief sources are fluorspar and cryolite, prepared by passing an electric current through liquid hydrofluoric acid. It is a colorless gas with an odor like that of chlorine, is extremely energetic, combining with all elements except oxygen; it is, therefore, very difficult to preserve it. See HYDROFLUORIC ACID.

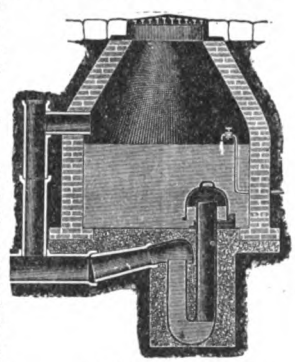
**Fluorite,** or FLUORSPAR. $CaF_2$. Calcium fluoride, common as a gangue of metallic ores, and also occurring as an independent mineral. It crystallizes beautifully in large cubes, and exhibits a variety of colors. It is too soft for use as a gem. Its easy fusibility adapts it for a flux in smelting operations. In 1894, 9,000 tons were produced, valued at $64,000.

**Fluosilicates.** Salts of HYDROFLUOSILICIC ACID, $H_2SiF_6$ (q.v.).

**Flushing.** Fortified town of Zealand, Netherlands, on island of Walcheren; birthplace of De Ruyter. Here the revolt against Spain began. It has a fine harbor, and is of naval and commercial importance. Pop., 1891, 13,500.

**Flushing Tunnel.** Built to furnish water for flushing or cleansing a sewage canal: *e.g.*, at Milwaukee, Wis., the sewage is discharged into a river, and to flush it a tunnel is built through which water from Lake Michigan is forced by a wheel operated by steam engines.

**Flush Tank.** A water-tank whose contents are automatically discharged at periodic intervals for the purpose of flushing a sewer. Such tanks are a necessary part of the separate system of sewage.



Flush Tank.

**Flustrina.** See CHILOSTOMATA.

**Flute.** Musical instrument of the wood-wind family; in its primitive form, of vast antiquity. It consists of a tube with a cylindrical bore and holes and keys to be governed by the fingers. The sound is produced by blowing against the sharp edge of a hole in the side of the tube near the upper end, whereby the column of air in the tube is set in motion. Flutes were once divided into beak and traverse, or German flutes; but the former, made on the principle of the ordinary whistle and blown at the end, are now known as Flageolets, and seldom used except as toys. The modern flute has a compass of three octaves.

**Flute.** In Architecture, a vertical concave recess, especially in a column, which when thus channeled is said to be fluted.

**Fluviatile.** Aquatic plants.

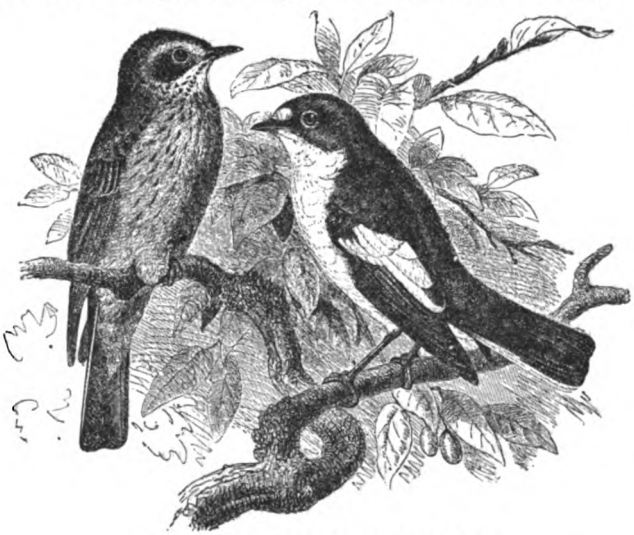
**Flux.** Substance used in metallurgical and other operations as a liquid medium in which chemical reactions may take place at high temperatures. It must, therefore, be a substance fusible without difficulty and which does not act injuriously on the product. Fluorspar is largely used as a flux.

**Flux.** Unhealthy discharge; dysentery.

**Fluxions.** Changes in quantity on which Newton based the new analysis, now called Differential Calculus. The fluxion of any variable quantity at a given instant was defined as what the change in the variable (called a fluent) would be in a unit of time if the change at that instant became uniform for the given unit. The fluxion of a quantity was indicated by a dot directly above the symbol for the quantity; thus $\dot{x}$ indicated the fluxion of x.

**Fly.** See DIPTERA.

**Fly-Catchers.** Birds belonging to families *Tyrannidæ* (New World), and *Muscicapidæ* (Old World). The former are olivaceous above, yellowish below, and have orange-red crown or other markings, imitating an attractive flower. They are



Spotted Fly-Catcher and Pied Fly-Catcher.

tropical; a few migrate n. into the U. S. The latter resemble the former in having wide mouth and rictal bristles, but differ in having leg scutellate only in front. They are also tropical, with bright markings, and include ab. 400 species.

**Flying Bridge.** Large boat or raft firmly moored in the center of a stream, if the stream be straight, or on the bank if the channel be curved, by means of which a crossing may be effected with aid of the current acting against the boat's side.

**Flying Buttress.** Beam, bracket, or part of an arch placed on the inside of the wall of a building opposite to a buttress on the outside, and connecting the wall and the roof truss, its object being to transfer part of the thrust of the rafters to a point on the wall lower down than that where the rafter abuts.

**Flying Dutchman.** Mythical navigator, Vanderdecken, doomed for his sins fruitlessly to sail the south seas in search of a haven forever. As a mariner's superstition it is universally found, and the sight of the phantom ship is a presage of evil.

**Flying Fish.** See ANACANTHINI, ACANTHOPTERI, GUNARD, and EXOCŒTUS.

**Flying Fox.** See BATS.

**Flying Lemur.** See GALEOPITHECIDÆ.

**Flying Machine.** The apparatus invented by Hiram S. Maxim was a large aeroplane with connecting wings, 105 ft. wide, supporting a platform upon which the engine and boiler were placed, two screw propellers, 17½ ft. diameter, driving the apparatus through the air. The lifting power of the machine was 10,000 lbs. It was fitted with wheels between two railroad tracks, placed one above the other, so that it would have a rise of one inch in the air. In July, 1894, with two others, Maxim was carried 320 ft. on the horizontal. S. P. Langley's flying machine had an aluminium body, weighing 2 lbs., with a boiler and engine propelling two wooden screws. Four aeroplanes supported the apparatus. In Dec., 1894, the machine flew 900 ft. The sustaining power of aeroplanes has long been known; by them Guidotti claimed a flight of 1,320 ft. in 1569. See AIR SHIP and FLIGHT IN ANIMALS, POWER OF.

**Flying Sap.** Military trench constructed generally with the aid of a sap-roller in its front, and by means of gabions on that side from which the enemy's fire comes. Parallels and approaches are constructed by means of the flying sap when the simple trench can no longer be used, owing to the enemy's musketry fire.

**Flying Squirrel.** *Sciuropterus volucella.* American Squirrel, a foot long, including the tail, which has long hairs on the sides, forming an efficient steering apparatus when the animal takes its long leaps, of sometimes over 100 ft. By

Flying Squirrel (*Sciuropterus volucella*).

means of an elastic fold of skin on each side stretched between ankle and wrist, when the legs are extended laterally, a perfect aeroplane is formed, which supports the body in the gliding leap.

**Fly Paper.** Paper dipped in water solution of potassium arsenite for killing flies; sweetened solution of quassia and certain sticky substances are also used.

**Fly-Poison.** *Amianthium muscætoxicum.* Linear-leaved white-flowered wood plant of the Lily family, native of the s.e. U. S.

**Fly Powder.** Mixture of arsenic and arsenious acid, for killing flies.

**Fly-Wheel.** Wheel with a heavy rim put upon the revolving shaft of a prime mover to neutralize the periodic variation in the effort of the motor fluid per revolution and the variation in the resistance as compared to the power, so as to make the shaft turn steadily. In expansive-working crank steam engines the first fluctuation is the result both of diminishing pressures in the cylinder as the steam expands, and the increasing and diminishing leverage of the crank to produce rotation. If the amount of permissible fluctuation in speed, $\frac{1}{m}$, for ordinary purposes be put at $\frac{1}{30}$ of the mean speed (or at $\frac{1}{50}$ to $\frac{1}{60}$ for fine factory purposes), and the difference between the maximum and minimum energy of the machine be called $\triangle E$, and v denote the velocity of the rim in feet per second, the weight of the rim will be derived from the formula:

$$W = \frac{mg\triangle E}{v^2}.$$

In ordinary mill work this will become:

$$W = \frac{1000}{v^2}\triangle E.$$

The quantity $\triangle E$ in single cylinder engines has been determined to vary from $\frac{1}{10}$ to $\frac{1}{4}$ of the total effort in one revolution. When two cranks at right angles are used, this quantity has but $\frac{1}{4}$ of its value for one cylinder, and for three cranks at 120° it has but $\frac{1}{12}$ of its value. $\triangle E$ being computed in foot-pounds per second, and divided by feet per second, gives a quotient in pounds.

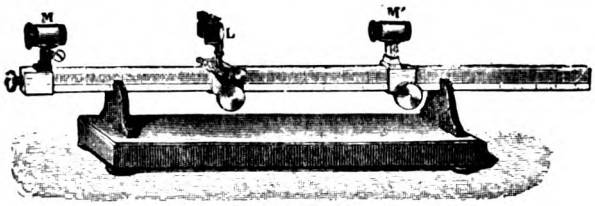
**Focal Chord.** Straight line limited by the curve and passing through its focus.

**Focal Length.** Distance from the optical center to the PRINCIPAL FOCUS (q.v.) in a lens or mirror.

**Focal Planes.** Planes passed through the incidental focus or the refractional focus and perpendicular to the axis of an optical lens system.

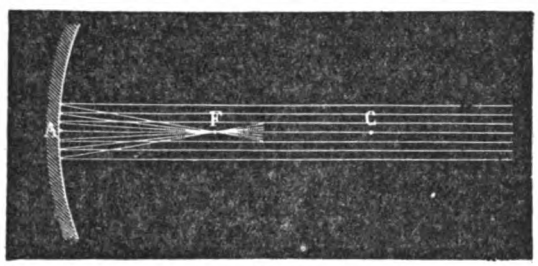
**Focometer.** Invention of Silbermann's for measuring the focal lengths of convex lenses. It is based on the principle that when the object and its image are equidistant from the lens, their distance from each other is four times the focal length. It consists of a graduated rod with three sliders, the middle one carrying the lens and the others carrying two thin plates of some translucent material, ruled with lines which are the same distance apart in both. The sliders must be adjusted till the image of one of these plates is thrown upon the other without change of size, as tested by the coincidence of the ruled

lines. The distance between them is then divided by four to obtain the focal length.




Silbermann's Focometer.

**Focus.** Point with reference to a lens or mirror at which luminous rays or their prolongations meet after refraction or reflection. Foci are either real or virtual. If a pencil after refraction or reflection is convergent, the point at which the rays meet is a real focus; but if the pencil is divergent, the point from which the rays appear to diverge or at which they meet if prolonged backward is a virtual focus. The focus of rays parallel to the principal axis of a lens or mirror is called the principal focus, and its distance from the nearer surface is the principal focal length. If we consider a luminous point P and




Focus.

A, Pole of Mirror; F, Principal Focus; C, Center of Curvature.

its image P′, these points taken together are called conjugate foci, and are mutually interchangeable. It can be shown geometrically that the relation of the conjugate focal lengths to the principal focal length is given by the formula,

$$\frac{1}{P}+\frac{1}{P^1}=\frac{1}{f}.$$

The foci of concave lenses and convex mirrors are always virtual, whatever the position of the luminous point P. In the case of a convex lens and a concave mirror, if P be within the principal focus, P′ is virtual. In all other cases P′ is real. If P be an object and P′ its image, the same rules apply.

**Focus,** MATHEMATICAL. Fixed point used as a basis for the primary constants of certain curves.

**Fodder.** Food or food material for domestic animals. In speaking of feeding animals, it is any material that either singly or in combination will make a suitable food, while forage is usually limited to coarse fodders, as hay, straw, and stover. Feeding stuffs for domestic animals contain: 1. Protein (albuminoids), which includes nitrogenous materials, which resemble egg albumen, lean meat and milk curd, and this goes to the formation of muscles, tendons, tissues and membranes. 2. Fat, which includes fat, wax and chlorophyl. 3. Nitrogen-free extract (carbhydrates), which includes starch, sugar, gum, and pectin bodies. 4. Fiber (cellulose). The last three sustain animal vitality and heat by oxidation: when these three are insufficient protein takes their place. 5. Ash, which is the mineral residue, after combustion. 6. Water. All these are necessary for animal life, but the relative proportions vary with the object in view; *i.e.*, whether the animal is for work, food, milk or wool. The nutritive ratio is the percentage of protein to the combined percentages of fat, nitrogen-free extract and fibre, that of the fat being multiplied by 2½. The digestibility of these constituents differs in feeding.

*Percentage Composition of Feeding Stuffs.*

| | Protein | Fat | N. f. E. | Fiber | Ash | Dry Matter |
|---|---|---|---|---|---|---|
| Clover ensilaged | 3.40 | 1.02 | 9.76 | 7.43 | 2.83 | 24.42 |
| Clover Hay | 11.44 | 2.02 | 39.87 | 26.69 | 5.23 | 85.35 |
| Timothy Hay | 6.02 | 2.20 | 46.26 | 30.35 | 3.98 | 88.81 |
| Wheat Straw | 4.98 | 1.49 | 41.99 | 38.08 | 6.96 | 93.50 |
| Mangolds | 1.71 | 0.20 | 4.18 | 0.82 | 1.05 | 7.96 |
| Ruta Bagas | 1.15 | 0.09 | 9.11 | 1.16 | 1.41 | 12.92 |
| Oats | 11.30 | 5.00 | 61.00 | 9.00 | 3.00 | 89.30 |
| Corn | 10.59 | 5.49 | 69.73 | 2.10 | 1.55 | 89.46 |
| Brewers' Grains kiln-dried | 20.30 | 6.40 | 54.89 | 11.79 | 3.97 | 97.43 |

*Digestibility of Feeding Stuffs, percentage.*

| | Dry Organic Matter | Protein | Fat | N. f. E. | Fiber |
|---|---|---|---|---|---|
| Pasture Grass | 77 | 75 | 66 | 78 | 75 |
| Meadow Hay | 60 | 57 | 48 | 62 | 58 |
| Mangolds | 88 | 76 | | 95 | |
| Corn | 91 | 78 | 63 | 94 | 100 |
| Brewers' Grains | 63 | 73 | 84 | 64 | 39 |
| Oats | 72 | 86 | 78 | 76 | 24 |

*Feeding Standards. Pounds per day per* 1,000 *lbs. live weight.*

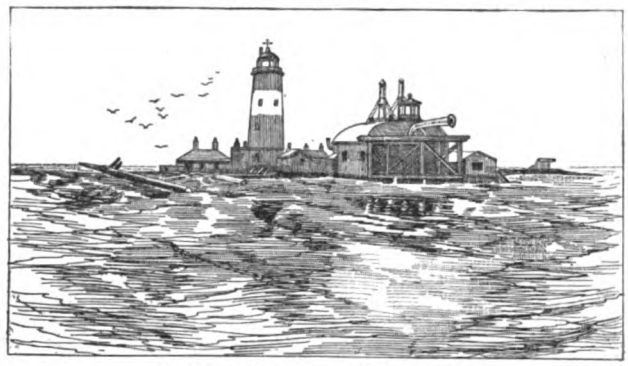
| | Total Organic Matter | Protein | N. f. E. and Fiber | Fat | Total Nutritive Matter | Nutritive Ratio |
|---|---|---|---|---|---|---|
| Horse, light work | 21.0 | 1.5 | 9.5 | 0.40 | 11.40 | 1:7 0 |
| " hard work | 25.5 | 2.8 | 13.4 | 0.80 | 17.00 | 1:5.5 |
| Oxen, at rest | 17.5 | 0.7 | 8.0 | 0.15 | 8.85 | 1:12.0 |
| " hard work | 26.0 | 2.4 | 13.2 | 0.50 | 16.10 | 1:6.0 |
| " fattening | 26.0 | 3.0 | 14.8 | 0.70 | 18.50 | 1:5.5 |
| Milk cows | 24.0 | 2.5 | 12.5 | 0.40 | 15.40 | 1:5.4 |

**Fœtal Membranes.** Structures evolved by cenogenesis for the service of the embryo. They are the amnion, allantois, chorion, and placenta.

**Fœtus.** Unborn young of an animal; usually limited to one after quickening has occurred. With the human race this occurs about the end of the fourth month.

**Foggia.** City in Apulia, s. Italy, 80 m. n.e. of Naples. It has considerable trade in wool and agricultural products. Pop., 1890, 38,000.

**Fog-Horn.** Instrument for warning vessels of each other's presence, or of the neighborhood of coast or rocks, in thick



Fog-Horn at Dungeness Lighthouse.

weather. The most powerful ones are worked by steam and are audible 20 to 30 m. distant.

**Fo-hi,** or FUH-HI. 2852 or 3322 B.C. Legendary founder of Chinese civilization; inventor or introducer of letters, marriage, religion, the use of iron, and the division into tribes.

**Föhn,** or **Fön, Wind.** Dry hot wind blowing down from the summits of the Alps into the valleys below. Its warmth and dryness is due to the compression of the air as it descends. Similar winds are known in other mountainous countries. See SOLANO.

**Foil.** In Gothic Architecture, a segment of a circle, often molded and additionally decorated. An assemblage of three foils to form an opening is known according to the number as a trefoil, quatrefoil, cinquefoil, etc., and the point of junction of the foils is called a cusp.

**Foissonnement.** Increase in bulk assumed by earth or other material after excavation. For earth this amounts to $\frac{1}{8}$ or $\frac{1}{12}$, and for sand ab. $\frac{1}{20}$ its original volume.

Gaston de Foix, 1489–1512.

**Foix,** COUNTS OF. ROYER DE F., d. 1064, was first to bear the title.—GASTON III., 1331–1391, became Gov. of Languedoc and Gascony, rescued the royal family during the Jacquerie 1358, and wrote on the chase.—GASTON IV., d. 1472, succeeded his father-in-law, John II., King of Navarre.—Another GASTON, 1489–1512, was made Duc de Ne-

mours 1505, showed brilliant military genius in Italian wars; overthrew the Swiss at Como and Milan; drove Julius II. from Bologna; seized Brescia, and won battle of Ravenna, where he fell, April 11, 1512, and was called the Thunderbolt of Italy. On his death at Ravenna the estates and title went to Henri of Navarre, grandfather of Henry IV. of France.

**Fold.** Series of strata bent and pressed together along an anticlinal or cynclinal axis. Generally the steepness of the dip is greater on one side of the fold than on the other. See OROGRAPHY.

**Fole-Land.** Surplus or unappropriated land belonging to a community; originally grantable by king and witan, later by king alone.

**Folengo,** TEOFILO, 1491–1544. Italian burlesque poet, probably the inventor of Macaronic verse. *Merlini Cocaii; Macaronicon; Orlandino; Chaos del Triperuno.* Repenting his frivolities, he became a monk 1526.

**Foley,** JOHN HENRY, R. A., 1818–1874. Irish sculptor.

**Folger,** CHARLES JAMES, LL.D., 1818–1884. Judge of N.Y. Court of Appeals, 1871–1881; U. S. Sec. Treasury 1881–84; defeated by Cleveland for Gov. of N.Y. 1882.

**Folgoré,** ab. 1300. Italian poet, known only by his sonnets, tr. by J. A. Symonds and Dante Rossetti.

**Foliaceous.** Resembling a leaf; thallus of certain Lichens and Algæ.

**Foliated Tellurium.** Nagyagite; ore of gold and lead combined with tellurium and sulphur, originally found in Transylvania, and also reported from Colorado; not found in large quantity.

**Folium of Des Cartes.** Curve of the third degree, having as its equation referred to tangents at the vertex of the oval $x^2+y^2-3axy=o$. It has two infinite branches and a rectilinear asymptote, $x+y+a=o$.

**Folkes,** MARTIN, F.R.S., 1690–1754. Numismatist and antiquarian; pres. Royal Society 1741. *English Gold Coins,* 1736; *Silver Coins,* 1745.

**Folkestone.** English watering-place and packet-station

Folkestone.

for France near Dover in Kent; originally a Roman settlement. The town lies partly in a hollow between two high cliffs, has a battery and a harbor admitting vessels of from 10–12 feet draught at high water. Dr. Harvey, the discoverer of the circulation of the blood, was born here 1578. Pop., 1891, 23,700.

**Folklore.** Popular legends, traditions, superstitions, customs, and observances. This branch of study is of increasing importance as its value in tracing the history of a race is recognized. Many books of English folklore have been written, notably Aubrey's *Miscellanies,* 1696; Sir Thos. Browne's *Pseudodoxia Epidemica,* 1646; Brand's *Antiquities,* 1777; Chambers' *Book of Days;* and many periodicals.

**Folk-Music.** Characteristic music of the peoples of the earth, as exemplified in dances and songs whose authorship is unknown. The term is modeled on Folklore, of which science the study of Folk-Music is a part.

**Follen,** CHARLES THEODORE CHRISTIAN, LL.D., 1796–1840. German refugee, Prof. Harvard 1830–34; lost in the *Lexington* on L. I. Sound. *Works,* 5 vols., 1841.—His wife, ELIZA LEE CABOT, 1787–1860, wrote much in prose and verse.

**Follicle.** Apocarpous dry fruit or pod, dehiscent along one suture only, as in Larkspur and Milkweed.—Small depression or sac in the skin or mucous membranes, as the pits which contain the hair roots.

**Follower.** Wooden cylinder placed on the top of a pile after it is driven so low that the ram cannot strike it.

**Fomentation.** Application of cloths, sponges or similar material, dipped in hot solutions or plain water, for the relief of pain or to combat inflammation; also the solution employed.

**Fomites.** Clothes, bedding, or any objects by which contagious diseases can be spread.

**Folz,** HANS, b. 1478. German meistersinger.

**Fonblanque,** ALBANY WILLIAM, 1793–1872. Ed. London *Examiner,* 1820–46; Sec. Board of Trade from 1846. *England Under Seven Administrations.* 1837.—His brother, JOHN SAMUEL MARTIN, 1787–1865, wrote on law reform.

**Fond du Lac.** Capital of Fond du Lac co., Wis., at s. end of Winnebago Lake. Pop., 1890, 12,024.

**Fonseca,** JUAN RODRIGUEZ DE, 1451–1524. Bp. of Burgos; chaplain to Isabella of Spain; in charge of American affairs and head of the Council of the Indies 1511; enemy of Columbus and Cortes, and a mischief-maker in general.

**Fonseca,** MANUEL DEODORA DA, 1827–1892. Brazilian General who joined with others to effect the deposition of Dom Pedro, Nov. 15, 1889. He became head of the Provisional Government, and in Feb. 1891 was elected Pres., but was compelled to resign Nov. 23.

**Fonseca,** PEDRO DA, 1528–1599. Portuguese Jesuit. His commentaries on Aristotle, 1572–1602, fill 4 vols.

**Font.** Vessel used to contain water for baptismal purposes. In Gothic Architecture, fonts are often highly decorated and among the richest objects of church furniture. At first a cistern, usually of stone; later, a raised vessel of wood, metal, or marble.

**Fontaine.** See LA FONTAINE.

**Fontaine,** PIERRE FRANÇOIS LOUIS, 1762–1853. French architect and writer, author of several public works in Paris.

**Fontainebleau.** Town of France, 37 m. s.e. of Paris, in a forest; noted for its palace, built 1169; long the favorite residence of the French kings; surrounded by gardens and

Fontainebleau in 1722.

parks, it has manufactures of porcelain, large trade in grapes and quarries of paving stones. Here Napoleon I. signed his first abdication, 1814. Pop., 1891, 14,078.

**Fontainebleau Limestone.** Variety of calcite, containing as an impurity a large amount of quartz sand.

**Fontaines,** MARIE LOUISE CHARLOTTE (DE GIVRI), d. 1730. French novelist.

**Fontana,** DOMENICO, 1543–1607. Italian architect and engineer, author of parts of the Lateran, Vatican, and Quirinal, of other public works at Rome, and of the palace and canals at Naples.

**Fontanella,** FRANCESCO, 1768–1827. Italian grammarian and lexicographer.

**Fontanelles.** Unossified spaces between the bones of an infant's head. The principal ones are in the middle line, one in front of the occipital bone, and another behind the frontal. They ossify in early adult life.

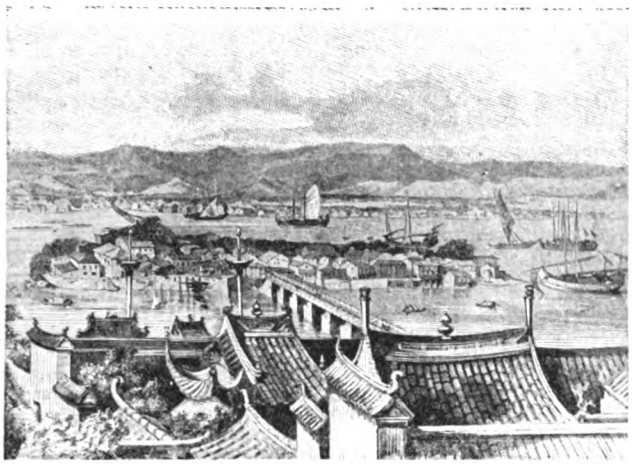
**Fontanes,** LOUIS DE, 1757–1821. French poet and journalist, in exile 1794–99; Pres. of the Assembly 1804, Senator 1810, Privy Councilor 1815, Marquis 1817.

**Fontenelle,** BERNARD LE BOVIER DE, 1657–1757. French poet and essayist, noted for versatility and wit; Academician 1691. *Dialogues of the Dead,* 1683; *Plurality of Worlds,* 1686; *Geometry of the Infinite,* 1727.

**Fontenoy.** Village of Hainault, Belgium; scene of a victory of the French under Saxe, May 11, 1745, over Cumberland and the Allies. Pop., 1890, 819.

**Fonvielle,** WILFRID DE, b. 1828. French aeronaut. Author of works on the use of the balloon in Meteorology.

**Foochoo.** City of China, one of the seaports open to foreign commerce; on the Nim Kiang just above its mouth. The river is divided into two channels by the island of Chung-



View of Foochoo, from the British Consulate.

Chow. Between this island and the n. bank of the river extends the bridge of Ten Thousand Ages, resting on 40 piers of hewn granite, believed to have been built in the 11th century. Pop., 1891, ab. 636,000.

**Food.** Broadly, everything taken into the body which nourishes it or supplies its waste: in a more restricted and more commonly employed sense, those elements which are taken in by the mouth and elaborated by the alimentary canal are usually divided into the carbonaceous or fat-producers, and nitrogenous or flesh-formers; but a very rigid separation is impossible, as the two groups overlap somewhat. In the first are included fats, sugars, and other carbohydrates, and in the latter, bodies containing nitrogen, such as albumen, casein, etc., whether derived from the animal or vegetable kingdoms. A daily allowance of ab. 21 ounces of the first and 4 ounces of the latter will supply the needs of an average man performing a fair amount of labor; 14 ounces of meat, 18 ounces of wheat bread, and 3 ounces of butter or fat closely represent the above amounts. To prevent disgust for food and maintain the appetite, fruit, vegetables, etc., should be added. For the bare preservation of life about one-half of the above is all that is necessary, but such a diet cannot be maintained for any long period. About 3 pints of water in addition to that contained in the solid food is needed each day, and one half-ounce of common salt.

**Fools,** FEAST OF. Survival of revival in the Middle Ages of the ancient Saturnalia. It was variously observed in different parts of Europe, had several rituals, lasted till the Reformation, and in s. France till ab. 1645.

**Fools' Gold.** Iron pyrites.

**Fool's-Parsley.** *Æthusa cynapium.* White-flowered herb of the Carrot family, native of Europe, introduced into N. America.

Fool's-Prasley; *a*, umbel.

**Foot.** Unit of lineal measure; the English foot equals 30.48 centimeters and is divided into 12 inches.

**Foot,** SOLOMON, 1802–1866. M. C. from Vt. 1843–47; U. S. Senator from 1851.

**Foot.** In man, this is the portion of the lower limb below the ankle, and is made up of a framework of twenty-six small bones, firmly united by ligaments and muscles and tendons by which it is moved. It is arched from behind forward, the elevation above forming the instep, and also transversely, the highest portion of the latter being on the inner side. The entire weight of the body is sustained by the first arch, which is supported by the heel and the broadest portion of the foot. It articulates above with the tibia and fibula, and free motion in nearly every direction is possible.

**Foot and Mouth Disease.** Febrile disease of cattle and sheep; highly contagious, but rarely fatal. The most prominent symptom is small blisters in the mouth and on the hoofs. It is communicable to man by contact and by the use of the milk of affected cows.

**Foot Artillery.** Used for the service of siege and sea-coast guns. The battery consists of 1 captain, 2 first and 1 second lieutenants, 5 sergeants, 4 corporals, 2 musicians, 2 artificers, 1 wagoner, and 50 privates; 4 commissioned officers, and 64 enlisted men.

**Football.** The Rugby Union game is played by fifteen men on a side divided into forwards and backs; the backs usually made up of halves or quarterbacks, threequarterbacks and goal tends. It is permissible to carry the ball in the arms or hands, to pass it in any direction save toward the opponents' goal, and to kick it in any direction. The men are restrained in their separate parts of the field by laws of off and on side, which means that a man cannot interfere with the player or the ball when he is between the ball and his opponent's goal line. The scoring is by touchdowns and kicking goals. A touchdown is placing the ball on the ground across the line of the opponent's goal, and this entitles the side scoring the touchdown to a try at the goal. The ball may also be kicked over the goal bar by a place kick, that is, from a position of rest on the ground; or a drop kick, that is, when the ball is dropped from the hand of the kicker and struck by the foot immediately upon its rising from the ground. The player who is running with the ball may be tackled, may be seized in the arms by an opponent, and when tackled he must cry down, and the ball is then placed on the ground for what is called a scrimmage. The players of the respective sides then gather around it, each side keeping between the ball and his own goal, and at a given signal both sides endeavor by kicking to drive the ball in the direction of the opponents' goal line. A certain time of game is allowed.

In Association football, the ball is propelled with the foot and cannot be handled. The field is 100 yds. by 50 to 200 by 100. There are eleven men on a side, and the ball is round, 28 in. in circumference. The kick-off is like the Rugby game, the ball being canted from the center of the field. The game consists of two halves of 45 minutes each. A goal is scored by sending the ball between the goal posts under the bar, not being thrown, knocked down, or carried by any one of the attacking side.

American Intercollegiate football was but an excuse for a general battle between Sophomores and Freshmen, and, until the seventies, there was very little that could be dignified with the name of game. Beginning with the seventies, however, it took on form which was affected by the Association rules. The players were allowed to kick the ball, but not to pick it up, throw it, or carry it. After some four or five years Harvard, who had played with Canadian teams under Rugby Union rules, introduced the English Rugby Union, and a game was played between Harvard and Yale under a compromise set of rules made up of the Rugby Union and the old intercollegiate. In 1876 both colleges adopted the Rugby Union, and from this the present intercollegiate game has been evolved. As the game is now played it differs from the Rugby Union principally in the outlet of the scrimmage and in what is known as interference but which is really offside play.

The Americans have given up the general indiscriminate kicking in the scrimmage, and the man in the center after a down snaps the ball back in his hand to the quarterback, who then passes it to some other of his side for a kick or a run. Interference consists in the protection of the runner, who has the ball, by his comrades, who get between him and the opponents who are endeavoring to tackle him. In other respects the game is not greatly altered from the Rugby Union. The scoring is by touchdowns and goals, but with an addition to the Rugby Union rules, that the side having possession of the ball must advance it five yards in three downs or take it back twenty yards in the same number of downs or surrender it.

**Foote,** ANDREW HULL, 1806–1863. U. S. Admiral. He took Fort Henry Feb. 6, 1862; attacked Fort Donelson Feb. 14, and compelled the surrender of Island No. 10 April 7.—His father, SAMUEL AUGUSTUS, 1780–1846, was M. C. 1819–21, 1823–25, and 1833–34; U. S. Senator 1827–33, and Gov. of Conn. 1834.

**Foote,** ARTHUR, b. 1853. American composer of pianoforte pieces, songs, orchestral suites, and cantatas.

**Foote,** HENRY STUART, 1800–1880. U. S. Senator 1847–52; Gov. of Miss. 1853. *Texas*, 1841; *Bench and Bar of the Southwest*, 1876.

**Foote,** MRS. MARY (HALLOCK), b. 1847, m. 1876. American novelist and artist, whose books deal with Western mining life. *Led Horse Claim*, 1882; *John Bodewin's Testimony*, 1885; *In the Cœur d'Alène*, 1894.

**Foote,** SAMUEL, 1720–1777. English actor and dramatist,

noted for wit and mimicry. He played almost wholly in his own pieces.

**Foote's Resolution.** Introduced in U. S. Senate by S. A. Foote of Conn., Dec. 29, 1829, proposing an inquiry into the expediency of limiting the sale of public lands for a time to those previously offered. It aroused the West and the South, and gave rise to the famous debate between Hayne of S. C. and Webster of Mass.

**Footing.** Base of a masonry wall or pier, widened so as to distribute the weight over a greater area.

**Foot of a Line.** Point where the line is limited by the element used as a base of reference. In plane loci this element is usually the principal axis of the curve.

**Foot of Mollusks.** 1. Fleshy pointed mass which the clam protrudes from its shell and, pushing into the mud, thus propels itself forward. 2. Disk-like base on which the snail or slug crawls.

**Foot-Pound.** Gravitation unit of work in the English system. It is equal to the work required to raise the mass of one pound through the distance of one foot vertically against the force of gravity. It equals ab. 32 foot-poundals.

**Foot-Poundal.** Absolute unit of work in the F.P.S. (foot-pound-second) or English system. It is equal to the work done by the force of one poundal when it has acted through the space of one foot. It is necessary to expend ab. one foot-poundal in raising ½ ounce one foot vertically against gravity.

**Foot-Rot.** Ulcerative, contagious disease of the feet of sheep, characterized by disorganization of the hoof and a foul-smelling discharge. Removal of diseased parts and thorough cauterization will effect a cure.

**Foot Step.** Form of bearing to steady and withstand the thrust and weight of a vertical shaft. See PIVOT and BEARING. For heavy pressures, the bearing area has to be flat and of size sufficient to prevent excessive load per sq. inch. Lubrication is best secured by having the end of the shaft in an oil bath, utilizing centrifugal force to distribute the oil by grooves across the end. Friction has been diminished by a hydraulic foot step, in which the end of the shaft rested on the surface of water kept by a pump at sufficient pressure to counteract the weight and keep the end of the shaft from the metal bottom of the step. This principle has been applied for horizontal bearings also (known as the "pallier glissant" by French adapters) with notable reduction of friction.

**Foot-Wall.** Country rock on under side of a mineral vein.

**Foot-Washing.** Act of hospitality among Jews, practiced by Christ as an example of humility; long a usage in the Ch., still observed on ceremonial occasions at Rome and Moscow; made an essential tenet by one or two Pa. German sects.

**Foppa,** VINCENZO, 1400–1492. Lombard painter, influenced

Martyrdom of St. Sebastian (Foppa), Milan Gallery.

by Mantegna; in style archaic. He has important pictures at Milan and Savona. His early pictures show the prominent characteristics of the Paduan school, but he shook off Montegnesque peculiarities and gained the mastery which comes from long practice.

**Forage.** See FODDER.

**Foraker,** JOSEPH BENSON, b. 1846. Judge Ohio Superior Court 1879–82; Gov. of Ohio 1886–89; U. S. Senator 1896.

**Foramen.** Opening, especially in bone, for the passage of vessels or nerves.—Pore or chink at end of the anther-sacs in certain plants, through which the pollen is discharged, as in the Potato and Laurel; orifice of the ovule, known also as Micropyle, especially after the ovule has ripened into a seed.

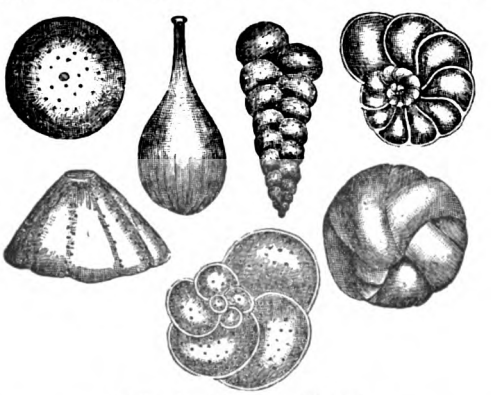
**Foramen of Panizzæ.** Opening between right and left aortic arches of crocodiles.

**Foramen Ovale.** 1. Opening from the middle ear into the inner ear into the cavum perilymphaticum, closed by the stipes (see AUDITORY VESICLES). 2. Opening in the fœtal heart, between the right and left auricles.

**Foramen Transversarium.** Opening between the transverse processes of the vertebræ and the cervical ribs of Birds and Crocodiles.

**Foramina.** Pores which pierce the shell of the *Foraminifera;* also small openings in the anatomy of higher animals.

**Foraminifera** (RETICULARIA, THALAMOPHORA). Class of Rhizopods, with usually calcareous shells, pierced by foramina for the exit of slender pseudopodia. There are two sections: PERFORATA or POLYTHALAMIA (q.v.), consisting of many chambered forms with shells, pierced by numerous pores, and of hyaline appearance; *Imperforata* or *Monothalamia*, consisting



Shells of various Foraminifera.

of forms with a single chamber, with one opening, and with the shell of chitinous, arenaceous, or porcellanous character. Most of the limestones of the world are formed from the shells of *Foraminifera*, as is also the mud at the bottom of the seas. The forms vary in size from microscopic dimensions to over an inch in diameter.

**Forbach,** BATTLE OF. Aug. 6, 1860. See SAARBRÜCK.

**Forbes,** ARCHIBALD, b. 1838. Scottish war correspondent, biographer of Chinese Gordon 1884, Emperor William 1889, and Gen. Havelock 1890. *Glimpses Through Cannon Smoke*, 1880; *Czar and Sultan*, 1894.

**Forbes,** EDWARD, F.R.S., 1815–1854. English naturalist; Prof. Edinburgh 1853; writer on starfishes 1841, and mollusca 1838–53.

**Forbes,** EDWIN, b. 1839. American etcher. His *Life Studies of the Great Army*, from studies made 1861–64, have a high rank. The first proofs from these plates were purchased by Gen. Sherman, and are now in the War Dept. *The Reveille, A Night March, Hauling Guns at Acquia Creek*, are among the finest of the series.

**Forbes,** JAMES DAVID, D.C.L., F.R.S., 1809–1868. Scotch physicist; Prof. Edinburgh 1833–59, St. Andrew's 1859. After diligent investigations on the movement of Glaciers, he was led to reject the Sliding Theory of De Saussure and the Dilatation Theory of Charpentier. Attacking the problem as one of pure physics, he made accurate measurements with instruments of precision, and afterward proposed the Viscous Theory, in which ice is regarded as a plastic body capable of slowly flowing under pressure.

**Forbes,** JOHN, 1710–1759. Scottish officer, prominent at Louisburg and Fort Duquesne, which he named Fort Pitt.

**Forbes,** SIR JOHN, M.D., D.C.L., F.R.S., 1787–1861. Scottish physician, knighted 1853; ed. *Medical Review*, 1836–48.

**Forbidden Fruit.** Various species of *Citrus* in different countries are so called from the popular legend that this was the fruit that tempted the first pair to disobedience. In England it is the shaddock; in France the *Citrus aurantium*, or *Pomme d'Adam;* in Italy the lime, or *Pomo d'Adamo.*

Forbidden Fruit (*Citrus aurantium*).

**Force.** Commonly defined as that which produces or modifies motion or pressure. It may be measured in two ways: first, by the amount of motion it can produce in one unit of time; or, secondly, by the strain produced upon the body to which the force is applied. In symbols, if f represent the force, m the mass put in motion, and a the acceleration, then $f=ma$ (1). Since acceleration is the velocity-change in one second, we may write from (1) $f=\frac{mv}{t}$ (2), which translated into words shows us that force is the time rate of change of momentum, or it is numerically equal to the momentum generated in one second. If we multiply both members of (2) by t, we get $ft=mv$ (3). The left hand member of (3) or the product of the force by the time during which it acts is called an Impulse. Thus for any given change in the momentum of a body the force is inversely proportional to the time during which it acts. If we multiply the numerator and denominator of the right-hand member of (2) by v and remember that $vt=s$, we may write $f=\frac{mv^2}{s}$ (4): since the energy of a moving body is proportional to $mv^2$, we may define force further to be the space rate of change of energy, or the rate of transference of energy.

An attractive force or an Attraction is the mutual action between two bodies in virtue of which if they were free to move they would approach each other. A repelling force or a Repulsion is the mutual action between two bodies in virtue of which if they were free to move they would recede from each other.

In order that an agent may exert force, it must meet with some resistance; force is then of a dual nature and is always the mutual action between two systems or parts of the same system. The direct force together with the reaction developed is called a Stress. This may be either a Tension or a Pressure; a tension if the parts tend to be separated, a pressure if they tend to approach one another. A stress is said to be homogeneous throughout a body when portions of it equal, similar and similarly placed suffer equal and parallel stresses on their homologous sides. Strain is the change of size or shape of a body which is produced by a stress. Change-of-size strain is called Compression or Dilatation; change-of-shape strain is called Distortion. A strain is said to be homogeneous throughout a body when portions of it equal, similar and similarly placed suffer equal and similar changes of size.

There are four units of force in common use, two absolute, the DYNE and the POUNDAL; and two gravitational, the GRAM and the POUND (q.v.). The dyne is the C. G. S. (centimeter-gram-second) unit of force and is that force which can impart to the mass of one gram the acceleration of one centimeter per second. One million dynes is called a Megadyne. The poundal is the F. P. S. (foot-pound-second) unit of force and is that force which can impart to the mass of one pound the acceleration of one foot per second. The gram force is the weight of one gram mass, and is equal to g dynes. The pound force is the weight one pound mass, and is equal to g poundals.

The dimensions of force are

$$[F]=[M][L][T]^{-2}.$$

**Force,** PETER. 1790–1868. Journalist in Washington, D. C.; author of a *Documentary History of American Colonies* and a *Record of Auroras.*

**Force Bill.** To secure Federal control of elections in the States; passed in the House July 2, 1890, but not in the Senate. It was an issue in the campaigns of 1891–92.

**Forcellini,** EGIDIO, 1688–1768. Author, with help from J. FACCIOLATI (q.v.) of a great Latin lexicon, 4 vols., 1771; reprinted 1805 and 1823–31; tr. 1828.

**Force of Gravity.** That which draws all bodies toward the center of the earth, and whose effect is observed in the weight of bodies. It is measured as equivalent to a force which is able to produce a velocity of 32.187 feet per second in a body from rest, neglecting air or other resistances. See FALLING BODIES, LAWS OF.

**Forceps.** Surgical instrument shaped like pincers. There are various kinds used in dentistry, dissection, and obstetrics. The use of the forceps dates from very remote antiquity.

**Forces,** POLYGON OF. One whose sides are parallel, and proportional in length to the intensity of the forces acting upon a body in equilibrium. If the force polygon does not close, the forces are not in equilibrium and the closing side will represent their resultant.

**Forces,** RESOLUTION OF. Operation of decomposing forces into components acting in given directions. By doing this, computations in mechanics are much simplified.

**Forchhammer,** JOHAN GEORG, 1794–1865. Prof. Copenhagen; writer on chemistry and Scandinavian geology.—His brother, PETER WILHELM, b. 1803, prof. Kiel 1836, wrote on Greek mythology.

**Forcible Entry and Detainer.** Unlawful entry or detainer of real property, by violence, to the dispossession of an actual occupant; a criminal offense at Common Law, and actionable civilly by statute.

**Forcing.** Method of hastening the growth of fruit, flowers, and vegetables, under heat, so as to produce them for the market out of season.

**Ford,** JOHN, 1586–ab. 1639. Eng. dramatist, noted for power and gloom. *Lover's Melancholy*, 1629; *Broken Heart*, 1633; *Love's Sacrifice*, 1633; *Perkin Warbeck*, 1634; *Lady's Trial*, 1639.

**Ford,** RICHARD, 1817–1858. English writer on Spain.

**Ford,** WORTHINGTON CHAUNCEY, b. 1858. Editor of Washington's writings, and of other documents of the revolutionary era.

**Fordun,** JOHN OF, 14th century. Scottish chronicler.

**Forearm.** Division of the upper extremity from elbow to wrist; composed of two bones, a number of muscles and tendons, blood vessels, and veins.

**Forebay.** Reservoir or penstock which delivers water directly to a mill wheel.

**Forebrain.** Anterior of the three vesicles or dilations of the embryonic, vertebrate brain in its earliest stages. It gives rise to the optic thalami, cerebral hemispheres, olfactory lobes, pineal gland, and infundibulum of the adult.

**Forecasts.** Daily weather predictions of U. S. Signal Office; term adopted 1889 from English use.

**Foreclosure.** Shutting out or extinguishing a mortgagor's equity of redemption. It may be done by equity action and sale, by advertisement, by an equity proceeding called strict foreclosure, or by entry and possession. The first two methods are the most usual.

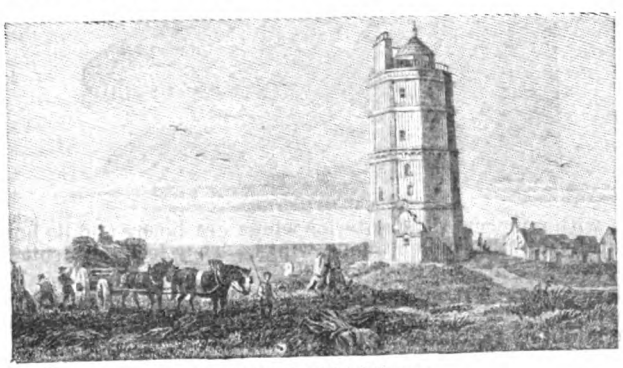
**Forefathers' Day.** Anniversary of the landing of the Pilgrims, Dec. 11, 1620, Old Style; first observed 1769 at Plymouth, Mass.; now celebrated Dec. 22. The correct day is Dec. 21.

**Foregut.** Œsophagus, or part of digestive canal lying in the neck-region of embryos.

**Foreknowledge.** Divine prescience of future events; whether the cause of those events has been a question much mooted among theologians.

**Foreordination.** Appointment from all eternity, by divine decree, of human fates and fortunes; chief tenet of the Calvinistic theology. Predestination is a part of it.

**Foreland,** NORTH AND SOUTH. Two headlands 16 m. apart



North Foreland Lighthouse.

on the e. coast of Kent, England. The Downs and Goodwin Sands stretch between them. Each has a lighthouse.

**Forerius,** FRANCISCUS, 1523–1587. Portuguese divine, active in the Council of Trent; provincial of the Dominicans 1568.

**Foreshortening.** Art of representing objects on a plane surface as they appear in projection. It requires great knowledge of perspective and chiaroscuro and reaches its highest excellence in the work of Correggio, Rubens, and Michelangelo.

**Forestalling.** Common-law crime of buying up provisions with a view to raise the price; abolished, and all statues relating to it repealed in England 1844.

**Forester,** FRANK. See HERBERT, HENRY W.

**Forest Laws.** Restrictions of the right of hunting to the king and those to whom he granted the privilege. Introduced by William the Conqueror, they were codified 1217, and fine, mutilation, and death followed their infringement. The Long Parliament abolished them 1640.

**Forestry.** Science of producing, maintaining, and advantageously utilizing forests, including their principal and by-products. It includes forest utilization, protection, working plans, sylvaculture, valuation, laws, and policy. Government forestry service is best exemplified in Germany, where the object desired is the benefit of the whole nation. In Prussia there is a thoroughly-organized service of 4,500 trained and officered men, the country being separated into forestry divisions. Nearly all European countries give attention to the subject. In U.S. little has yet been done. The U. S. Government has made forest reservations of 17,564,800 acres, but these and other government timber lands have little protection from fires and timber thieves. The total area of wooded land in Europe is estimated at ab. 770 million acres, 31 per cent of area, 2.5 acres per capita; in U. S. there are 450 million acres; 17 per cent of area, 7.6 acres per capita. The annual consumption of forest timber in U. S. is ab. 22 billion cubic feet, of which 18 billion is as fuel, 3 billion for lumber, 600 million for railroad construction, 500 million for fences, and 250 million for charcoal. The value of exports of wood, raw and manufactured, is $27,000,000, and of naval stores, products of pine forests, $7,300,000. The annual value of forest products in U. S. is approximately $1,000,000,000.

**Forestry Schools.** Instruction in forestry science is given either in polytechnic schools, as at Zurich, in connection with university courses, as at Giessen, in special schools, as at Eberswalde, Germany, or in connection with the study of agriculture, as at St. Petersburg. The Forest Academy of Eberswalde was started in Berlin 1821, and moved to its present location in 1830, for proximity of the forests. The instruction extends over two winters and three summers, and includes the fundamental sciences, with some legal studies and the construction of roads and the special forestry studies. It has ab. 150 students. There are 40 schools in Europe; America has none.

**Forey,** ÉLIE FRÉDÉRIC, 1804–1872. French general; active in the coup d'etat of 1851. He commanded the French force which invaded Mexico in Sept. 1862.

**Forfait,** PIERRE ALEXANDRE LAURENT, 1752–1807. French naval engineer and scientific writer.

**Forfeits.** Game in which the players redeem articles given up as penalties by the performance of some difficult or amusing feat, imposed by a selected judge.

**Forfeiture.** Loss of property inflicted on the owner by way of punishment, or by reason of his agreement. A forfeiture clause in a contract is not favored.

**Forficulidæ** (EARWIGS). Cursorial *Orthoptera*, with elongated body, with nine segments in the abdomen, the latter ending with a pincer. The anterior wings are horny and lie horizontally on the membranous wings. They feed on fruit at night.

Forficulidæ (Earwigs).

**Forgery.** Fraudulent making or alteration of a writing to the prejudice of another's right. Its definition and punishment are minutely regulated by modern statutes.

**Forget-me-not.** *Myosotis palustris.* Blue-flowered marsh herb of the Borage family, native of Europe, but widely cultivated and introduced into N. America; called also Scorpion Grass, as are other species of the genus.

**Forging of Metals.** Processes of shaping metals which have been made plastic by heat. These include upsetting, or shortening a bar by increasing its cross section by blows on the end; drawing down, or lengthening by reducing cross-section; swaging, or giving a special cross-section by the use of dies containing a part or the whole of the required shape. See DROP PRESS. Welding is the operation of uniting the particles of two pieces by pressure or blows, the contact surfaces having been brought to a plastic state by a white heat and being made free from oxide; punching and cutting off are done with solid punches and with chisels respectively. Tempering of steel is a forge process for giving to cutting implements just the hardness necessary to maintain their edge and yet not be too brittle. See TEMPERING. Bending is done over the horn or beak of the anvil. In handling large plate for boiler and other uses, flanging is the operation of bending up the plate at an edge at an angle so as to form a flange to fasten other parts to. This is done with wooden mauls so as not to draw down the plate nor dent it. Forging may be done by percussion, using HAMMERS (q.v.), or by pressure without blows. See HYDRAULIC FORGING. Dangers in forging come from defective welds, overheated metal, and too little hammering or with too light a hammer.

**Fork.** Unknown to the ancients for table use, forks were first found in Europe in the 13th century, but not till ab. 1620 were they general even among the highest classes except in Italy.—Well or excavation at the bottom of a mine shaft in which water is collected before pumping.

**Forkel,** JOHANN NIKOLAUS, 1749–1818. Director of music at Göttingen 1779. His *Allegemeine Geschichte der Musik*, 1788–1801, extends only to 1550.

**Forli,** MELOZZO DA, 1440–1492. Italian painter; one of the earliest masters to practice foreshortening; influenced by Mantegua. His few works are important.

Angel.—Fragment of the *Ascension*, St. Peter's, Rome (by Forli).

**Forlorn Hope.** Volunteers from the various regiments of an investing army to be first to storm the counterscarp or mount the breach. The name also implies any desperate service.

**Form.** In Music, has a varied meaning, but in all phases it is essential to artistic expression, and conditions the sense of symmetry, measure and order upon which the element of repose must rely. In a general way each kind of musical composition, such as the dance, march, song, lends its name to qualify the term, but there are a number of others of purely an arbitrary and artistic origin which convey specific ideas of musical construction based upon the general principles of beauty, such as symmetry, relationship, contrast, etc. Such are the Sonata form, with its three divisions, a trinity in unity, of exposition (introduction of the melodic element), illustration (free working out of the elements) and repetition. The relationship of keys, which has its simplest exemplication in the use of tonic and dominant in the songs of primitive peoples, the use of counterpoint and other factors in composition, the employment of rhythmical sections based upon established modes of dancing, all enter into and determine musical form.

**Form.** In the Platonic terminology, the permanent and real in existence; now, aside from the idea of shape, the essential properties upon which all classification is based.

**Formaldehyde.** H.COH. Gas obtained by oxidizing

methyl alcohol; little known, as it passes into a polymeric compound, trioxymethylene, with wonderful ease.

**Formal Rightness.** Quality of an action in which the agent is moved by pure desire to fulfill duty; opposed to material rightness, in which the right particular effects are intended, from whatever motive.

**Formamide.** $HCO.NH_2$. Bpt. 190°–195° C. Amide derived from formic acid; liquid prepared by heating ammonium formate. It boils with decomposition.

**Forman,** HARRY BUXTON, b. 1842. English critic, editor of Shelley and Keats.

**Formation of Troops.** The object of any formation is to enable its commander to utilize every soldier and weapon to the best advantage. The Drill Regulations prescribes all the formations that experience has found worthy to be retained in each arm of the service, and gives the orders by which troops may be changed from one formation to another. The principal formations are the company, regiment, brigade, division; troop and squadron; the battery; in column, open or skirmish order, or in mass; ceremonial formations, for parade, review, etc., and for battle and in maneuvering for position.

**Formative Pole.** See ANIMAL POLE.

**Formative Yolk.** Egg-protoplasm, the food yolk being the deuteroplasm. That part of the egg's contents which takes part in segmentation and constitutes the germ. In large eggs it forms a small aggregation at one pole of the yolk similar to the cicatricula of the fowl's egg.

**Formeret.** In groined vaulting a half-rib against a wall, so-called because it prescribes the form of the vault. It is not structurally indispensable and upon the continent of Europe is often omitted, but is almost invariably found in English Gothic work.

**Formes,** KARL, 1810–1889. German bass singer, known in Europe from 1842; chiefly resident in the U. S. from 1857.—His brother, THEODOR, 1826–1874, was a noted tenor.

**Formic Acid.** H.COOH. Bpt. 99° C. Simplest organic acid. It occurs in ants, in the nettle, in pine needles, and in various other animal and vegetable products. It is a powerfully-acid liquid, commonly prepared from oxalic acid by the direct or indirect abstraction of carbonic acid gas. It is easily decomposed, and acts as a reducing agent.

**Formic Ether.** $HCOO.C_2H_5$. Ethyl formate. Liquid, boiling at 55° with very agreeable odor and taste, suggesting cherry kernels; produced from formic acid and alcohol by the action of hydrochloric acid gas; used as a flavor.

**Formicidæ** (ANTS). Family of *Aculeata*, a sub-order of the order *Hymenoptera*. The males and females are winged; there are also imperfectly developed, wingless females known as workers. Sometimes the workers are divided into soldiers, with larger head and jaws, and the true workers. They possess poison glands, secreting formic acid, and often have stings. The acid is ejected into wounds made by the sting or by the jaws. Ants live in passages in the earth or in decayed

Ants: 1, male; 2, female; 3, workers.

wood; in these they usually hibernate; a few kinds lay up winter stores of food. Copulation takes place in flight: then the males die and the females lose their wings. Some ants are injurious to vegetation, others are of use to man as they attack insects. The psychical activity of ants is high, some have well organized armies and plan regular campaigns, enslaving the conquered species. Others keep Aphides as milch-cows, or rear servants from kidnapped young. The agricultural ant of Texas is said to cultivate a peculiar grain. In some species the masters are helpless and have to be fed by their slaves. In others the workers do nothing but capture slaves, carrying them in their mouths.

**Formosa.** Island of 13,330 sq. m., lying ab. 90 m. e. of China; length 237 m., average breadth ab. 70 m. The Chinese partly colonized it ab. 1350, and came into control in 1683. Several engagements occurred here in the Franco-Chinese war 1884–85. The railroad and the telegraph have been introduced. F. was ceded to Japan at the close of the war with China 1895. Pop. ab. 3,000,000.

**Formosa,** STRAITS OF. Between Formosa and China.

**Formosus,** POPE, 891–896. Having crowned two rival emperors, his body was disinterred, tried, condemned, and thrown into the Tiber.

**Formula.** Statement in general symbols of a mathematical principle or law.

**Formula.** Expression in chemical symbols of the composition of a compound. Many formulæ will also reveal the class of substances to which the compound belongs, its general characteristics, from what it has been derived, and how it will act under certain conditions. An Empirical formula gives the composition of a compound, as $H_2SO_4$. A Rational formula is one that expresses the composition of the molecule and indicates some facts in regard to the constituent part. It is not as complete as a constitutional formula; *e.g.*, $CH_3.CO_2H$. A Constitutional or Graphic formula indicates all that a rational formula does, and also expresses how the atoms in the molecule are united; *e.g.*, $\begin{array}{c} H \\ | \\ H-C-C=O \\ | \quad | \\ H \quad OH \end{array}$. A Stereo-Chemical formula expresses the positions the atoms of a molecule occupy in space. Thus the substance cited above, acetic acid, $CH_3.CO_2H$, would be represented by a tetrahedron having one carbon at the center, each of the three hydrogen atoms being at different angles, and the carboxyl group, $CO_2H$, occupying the remaining angle.

**Formula of Concord.** Drawn up 1580 by Lutheran divines, and agreed to by 86 German States. It closed the series of Symbolical Books which form the *Book of Concord*.

**Formyl.** $HCO^-$ Group or radical derived from formic acid by the removal of hydroxyl. See ACETYL.

**Forney,** JOHN WEISS, 1817–1881. Founder Phila. *Press* 1857, and Washington *Chronicle* 1860; Clerk of the House 1851–55, and 1859–61; Sec. U. S. Senate 1861–68; Collector at Phila. 1871–72. *Forty Years of Journalism*, 1877.

**Fornication.** Unlawful sexual intercourse; a statutory offense in which publicity or notoriety is often an element.

**Fornix.** Scales borne in the throat of the corollas of certain flowers, especially those of the Borage family.

**Forrest,** EDWIN, 1806–1872. American actor, steadily on the stage 1820–53, and occasionally till 1871; well known in England. He preferred Shakespearean parts, but was best fitted for such characters as The Gladiator and Metamora. His powers were great; his violent passions wrought injury to many, as Macready, N. P. Willis, and eminently Mrs. Forrest. He willed most of his property for the Forrest Home for Aged and Infirm Actors, in Philadelphia.

**Forrest,** JAMES, b. 1825. English civil engineer.

**Forrest,** JOHN, b. 1847, and ALEXANDER, b. 1849. Explorers of interior Australia.

**Forrest,** NATHAN BEDFORD, 1821–1877. Confederate officer, prominent at Shiloh and Chattanooga; Lieut.-gen. 1865. His capture of Fort Pillow, Tenn., April 12, 1864, and the consequent massacre of its negro garrison, caused much feeling in the North.

**Forrester,** ALFRED HENRY ("ALFRED CROWQUILL"), 1805–1872. English illustrator and author.

**Forshey,** CALEB GOLDSMITH, 1812–1881. Civil engineer at New Orleans; writer on the Mississippi, tornadoes, rainfall, and other climatic features.

**Förster,** ERNST JOACHIM, 1800–1885. German painter, author of a *Hist. German Art*, 1851–60, and books on cognate themes; biographer of Richter, Raphael, Fra Angelico, and others.—His brother, FRIEDRICH CHRISTOPH, 1791–1868, custodian of the Berlin Art Museum from 1829, wrote a *Hist. Frederick William I.*, 1835, and other works in prose and verse.

**Forster,** JOHANN REINHOLD, LL.D., 1729–1798. Prof. Halle 1780; in England 1766–68; naturalist on Cook's 2d voyage 1772. *Mineralogy*, 1768; *Flora Americæ*, 1771; *South Sea Plants*, 1776. —His son, JOHANN GEORG ADAM, 1754–1794, was prof. at Wilna 1784–88, and tr. *Sakuntâlâ*. *Ansichten vom Niederrhein*, 3 vols., 1791; Letters, 1829; Works, 9 vols., 1843.

**Forster,** JOHN. 1812–1876. English essayist and biographer. *Statesmen of the Commonwealth*, 7 vols., 1840; *Goldsmith*, 1848; *Sir John Eliot*, 1864; *Landor*, 1868; *Dickens*, 1871–74; *Swift*, 1876.

**Forster,** WILLIAM EDWARD. 1819–1886. M. P. from 1861; member of Gladstone's cabinet 1870; author of the Education and Ballot Bills 1870–72; Chief Sec. for Ireland 1880–82.—His father, WILLIAM, 1784–1854, was a noted Quaker preacher, philanthropist and reformer, and died in Tenn. while on an anti-slavery mission to the U. S.

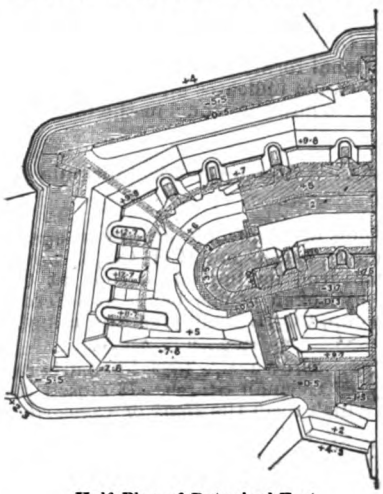
**Forsterite.** $Mg_2SiO_4$. Magnesium silicate, allied to chrysolite.

**Forsyth,** JOHN, 1780–1841. M. C. 1813–18 and 1823–27; U. S. Senator 1818–19 and 1829–34; U. S. Minister to Spain 1819–22; Gov. of Ga. 1827–29; U. S. Sec. of State 1834–41.

**Forsyth,** SIR THOMAS DOUGLAS, 1827–1886. Anglo-Indian official.

**Forsyth,** WILLIAM, LL.D., b. 1812 in Scotland. Queen's Counsel 1857, M. P. 1874–80; author of legal and historical works. *Life of Cicero*, 1864; *Novelists of 18th Century*, 1871; *Slavonic Provinces*, 1876.

**Fort.** In field fortification, works which from their location and strength depend mainly upon themselves for their defensive value. In permanent fortification, formerly a masonry structure with earthen parapets, constructed for the principal defense of the position; now a complex structure in armor, earth or sand and cement, to give secure cover to the most powerful modern guns.



Half Plan of Detached Fort.

**Fort Adams.** At entrance to Newport (R. I.) harbor; built 1828–38.

**Fort Donelson.** In Tenn.; surrendered to General Grant Feb. 16, 1862, with about 14,000 prisoners.

**Fort Duquesne.** See DUQUESNE, FORT.

**Fort Edward.** On the Hudson, 28 m. n. of Troy, N. Y.; built 1709, rebuilt 1755; named for the Duke of York; important in the French and Revolutionary wars; long since demolished.

**Fort Ethan Allen.** Cavalry post, established in 1893, ab. 5 miles e. from Burlington, Vt.

**Fortescue,** HUGH, EARL, b. 1818. M. P. 1841, Baron 1859, Earl 1861; writer on sanitary, municipal, and educational topics.

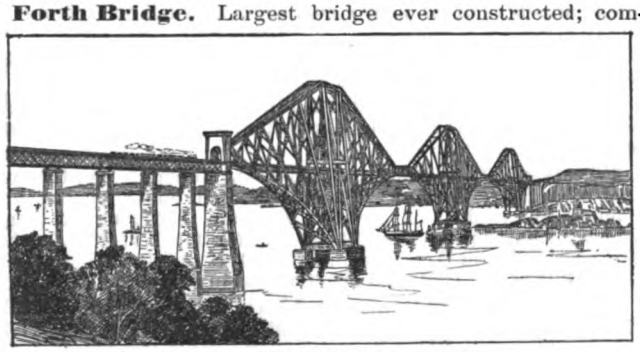
**Fortescue,** SIR JOHN, 1395–1476. Chief-justice 1442–60. *De Laudibus Legum Angliæ*, ab. 1466; *The Governance of England*, ab. 1470.

**Fort Fisher.** In N. C. near mouth of Cape Fear R.; built by Confederates; bombarded and guns silenced Dec. 13, 1864; taken by assault Jan. 15, 1865, with Union loss of 1,000.

**Fort Harrison.** In Va.; taken by a Federal detachment Sept. 28, 1864.

**Fort Hatteras.** In N. C.; taken by Union forces Aug. 29, 1861.

**Forth Bridge.** Largest bridge ever constructed; completed 1890 over the Firth of Forth, Scotland. The four main spans are of the cantilever type, two of which are each 1,710 ft. long. The total length of the bridge is 8,296 feet; the number of spans is 26. The total weight of steel used was 54,076 tons, of which 50,958 tons is in the four main spans.

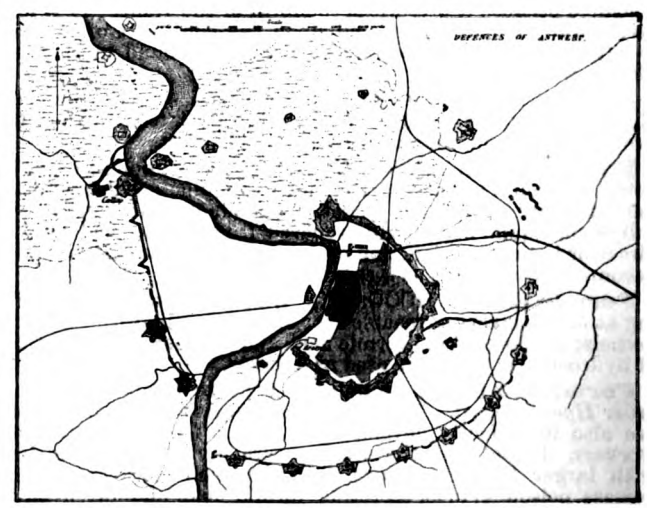


Forth Bridge.

**Fort Henry.** In Tenn., on the Tennessee R., surrendered to Com. Foote Feb. 6, 1862, the garrison escaping to Fort Donelson on the Cumberland, where most of them were taken Feb. 16.

**Fort Hindman.** See ARKANSAS POST.

**Fortification.** Art of preparing a military position for defensive purpose, so that its garrison may be relatively stronger than the force which an enemy may employ to attack it. The relative strength of the assailants to the defenders was formerly 10 or 5 to 1; but owing to the increased defensive power of small arms and modern artillery this proportion will be in the future much greater. Field or temporary fortification is employed to strengthen any natural position by intrenched lines, redoubts, bridge-heads, or other earthen works when the revetments for the preservation of the slopes are perishable and temporary. Often works of this character, when held by veteran troops, are unassailable, as shown at Fort Wagner, the Petersburg lines, the Plevna redoubt, etc. Semi-permanent works belong rightly to temporary fortification, though designed and constructed some time before their occupation to secure positions having a temporary, strategical value during a war or a campaign. Examples of such are the lines of Torres Vedras in Portugal, and the earthen forts and redoubts for the security of Washington and Richmond during the rebellion. Permanent works are designed to protect harbors, roadsteads, capitals, and vitally important strategical positions. Being vastly expensive, they are carefully designed and constructed by military engineers years before they are needed. Formerly, when the heaviest projectile weighed but 68 lbs., masonry structures with casemated and barbette batteries were perfectly efficient. But at present, to withstand even the 12-inch B. L. steel rifle, firing a projectile of 1,000 lbs., with a velocity 2,100 f. s., giving a muzzle energy of 30,000 ft. tons, requires the highest application of the principles of military engineering. The modern work requires great thickness of sand and concrete parapet, counterpoise gun-carriages, and often armor protection. A front of fortification comprises the series of works and outworks located on a side of the polygonal trace. Historically, the principal systems are the bastioned and the polygonal; the former, developed from the earlier designs of Vauban and Cormontaigne by the improvements of Noizet and other military engineers, are found in the now obsolete defenses of European cities, while the latter are well illustrated in the works constructed by Brialmont in the defenses of Antwerp. The present sea-coast forts of the U. S., as Hamilton, Wadsworth, Schuyler, in N. Y. Harbor, Adams at Newport, Warren at Boston, and Monroe at Old Point Comfort, are masonry works of the bastioned system. They are now being strengthened and modified to meet the demands of modern artillery.




**Fortiguerra,** NICCOLO, 1674–1735. Italian poet and satirist, tr. Terence. *Il Ricciardetto*, 1738.

**Fort Independence.** On Castle Island in Boston Harbor; begun 1832 on the site of Castle William.

**Fortitude.** Virtue which consists in the habit of not yielding to pain.

**Fort Jackson.** On the Mississippi, 78 m. below New Orleans; built 1824–32; passed by the Union fleet under Farragut April 24, 1862.

**Fort Leavenworth.** In Kansas, on the Missouri, built 1827; U. S. military prison and school for infantry and cavalry.

**Fort Lee.** In N. J., opposite New York; taken by the British, with large stores, Nov. 18, 1776.

**Fort McAllister.** In Ga., taken by Hazen's division of Sherman's army Dec. 13, 1864.

**Fort McHenry.** Near Baltimore, Md., built 1812; unsuccessfully assailed by a British fleet of 16 vessels Sept. 13, 1814.

**Fort Macon.** In N. C., captured by Federals April 23, 1862.

**Fort Marion.** At St. Augustine, Fla.; built 1650–1756; valued as a relic of antiquity.

**Fort Monroe.** On Old Point Comfort, s.e. Va.; begun 1817; largest fort in the U. S., covering 80 acres.

**Fort Morgan.** In Ala., at entrance to Mobile Bay; taken by Farragut Aug. 22, 1864. Fort Bowyer, its predecessor, was attacked by the British Sept. 15, 1814, and taken Jan. 11, 1815.

**Fort Moultrie.** On Sullivan's Island, at entrance to Charleston Harbor; abandoned by Major Robt. Anderson Dec. 26, 1860.

**Fort Niagara.** In N. Y., at mouth of Niagara R.; built by the French 1678; taken by British and Indians Dec. 1813.

**Fort Pickens.** On Santa Rosa Island, near Pensacola, Fla.; held by Major Slemmer against Confederates Jan. 1861.

**Fort Pillow.** In Tenn., taken by Confederates April 12, 1864. See FORREST, N. B.

**Fort Pulaski.** Near Savannah, Ga., built 1829–60; taken April 11, 1862, by Gens. Sherman and Gillmore.

**Fort St. Philip.** On the Mississippi, nearly opposite FORT JACKSON (q.v.), taken from the Confederates by Farragut April 1862.

**Fort Scott.** Capital of Bourbon co., Kan. Pop., 1890, 11,946.

**Fort Smith.** City of Sebastian co., Ark., on the Arkansas. Pop., 1890, 11,311.

**Fort Snelling.** Army post n. of St. Paul, Minn., on a high bluff above the Mississippi; first settlement in Minnesota.

**Fort Sumter.** In Charleston Harbor, S. C., built 1829–60; bombarded April 12–13, 1861; evacuated by Major Anderson April 14. Here the Civil War began.

**Fortuna.** Roman goddess of chance. Hesiod makes her

Fortuna (from the Vatican).

an ocean nymph; Pindar calls her child of Zeus, and again makes her one of the Destinies. Her temples and oracles were numerous in Italy. At Antium the statues bent forward when responses were given; at Præneste lots were used, and were in much esteem in Cicero's time.

**Fortunate Isles.** With Homer and the Greeks, probably the Canaries or Azores.

**Fortunatianus,** ATILIUS, 4th century. Roman writer on meters of verse.

**Fortunatus.** Hero of folklore, who has an inexhaustible purse, and a wishing cap. The tale in its German form was pub. 1509, and dramatized by Hans Sachs 1553. It exists in many shapes and languages.

**Fortunatus,** VENANTIUS HONORIUS CLEMENTIANUS, 530–609. Latin sacred poet of Italian birth, settled in France ab. 565; Bp. of Poitiers 599. His *Vexilla regis prodeunt* is counted one of the greatest Latin hymns.

**Fortune,** ROBERT, 1813–1880. English botanist, traveler, and author of several books on China, 1847–63.

**Fortuny y Carbo,** MARIANO, 1838–1874. Spanish painter of the first rank both in color and drawing, and a highly original nature. He lived much in Rome, but visited Morocco, and is largely known by Oriental sketches thence derived.

**Fort Wagner.** In S. C., assaulted unsuccessfully by Union forces July 10–11, 1863; again July 18, with loss of 1,600 men.

**Fort Washington.** On the Hudson, s. of the site of 186th st., New York; taken by the British Nov. 16, 1776.

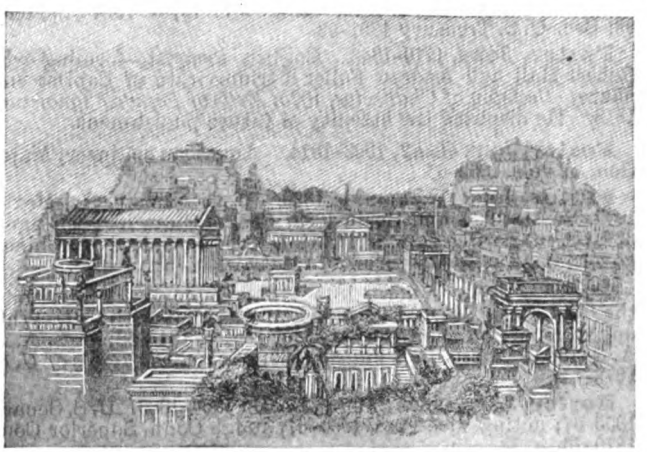
**Fort Wayne.** City of Allen co., Ind., on Maumee R. It is an important railroad center, and contains the shops of the Pittsburg, Ft. W. and Chicago, and the Wabash railroads. Pop., 1890, 35,393.

**Fort William Henry.** In N. Y., at head of Lake George, built by the British 1755; captured by French and Indians under Montcalm Aug. 1757, and demolished.

**Fort Worth.** Capital of Tarrant co., Texas, on Trinity R. It has car works, railroad shops, stock yards, and some manufactures. Pop., 1890, 23,076.

**Forty.** Number of continual occurrence in the Bible, and almost an equivalent for an indefinitely known number of days or years.

**Forum Romanum.** Open space in the heart of ancient Rome, originally a market place; later used for public assemblies and judicial proceedings, bordered on both n. and s. sides by temples. The ancient rostra were at the w. end. Other



Forum (Restored).

fora necessitated by the overcrowding of this were those of Julius Cæsar, Augustus, Vespasian, Nerva and Trajan, all containing temples. There were also several fora for traffic, as the F. boarium, or cattle market.

**Forward,** WALTER, 1786–1852. M. C. from Pa. 1821–25; Sec. U. S. Treasury 1841–43.

**Foscari,** FRANCESCO, 1372–1457. Doge of Venice 1423–57; celebrated by Byron.

**Foscolo,** UGO, 1778–1827. Italian poet, noted for his tragedies: *Thyestes*, 1797; *Ajax*, and *Ricciarda:* an epic, *I. Sepoleri*, 1807; and a political romance, *Letters of Jacopo Ortis*, 1802. He settled in England 1815, and wrote essays on Petrarch, 1821, and Dante, 1826.

**Foss,** SAM WALTER, b. 1858. American humorist and dialect poet; ed. *Yankee Blade* since 1887.

**Fossa Mariana.** Canal dug 102 B. C. by Marius from the Rhone to the sea, facilitating its entrance; length 16 m.

**Fosse.** Ditch of a fortification, either wet or dry.

**Fossil.** Any relic or trace of animals or plants found buried in the earth. Fossils have been called the medals of creation, inasmuch as they serve to mark successive ages of the earth's history. Every stratum contains its own series of them, whereby it can be recognized wherever it occurs. The study of these fossil remains has revealed a definite succession of organic beings in which the older as a rule are of lower grade than those that follow. The study of these relics forms the basis of the science of PALEONTOLOGY (q.v.).

**Fossil Ore.** Red hematite, abounding in or associated with fossil remains, and occurring at several points along the Appalachians, and in Wis., in rocks of the Clinton epoch of the Upper Silurian Age.

**Fossoria** (FOSSORES, DIGGING WASPS). Family of *Aculeata*, distinguished by not living in communities. They have straight antennæ and long legs, the tibiæ of which are armed with spines. The females dig holes in the earth or in decayed wood,

Fossoria.

in the ends of which they make cells containing each an egg, and food for the future larva. This food is usually of a definite species of insect or caterpillar, which has been paralyzed but not killed.

**Fossorial Feet.** Those adapted for digging.

**Fossula.** Space in Rugose corals where the septa are not developed.

**Foster,** BIRKET, b. 1825. English painter and illustrator

**Foster,** CHARLES, b. 1828. M. C. 1871–79; Gov. of Ohio 1880–83; Sec. U. S. Treasury 1891–93.

**Foster,** JOHN, 1770–1843. English essayist, forming with Robert Hall and Andrew Fuller a triumvirate of Baptist eminence. *Decision of Character*, 1805; *Evils of Popular Ignorance*, 1818. He disputed the eternity of future punishment.

**Foster,** JOHN GRAY, 1823–1874. American engineer; Major-Gen. of vols. 1862–65.

**Foster,** JOHN WATSON, b. 1836. U. S. Minister to Mexico 1873, Russia 1880, and Spain 1883; Sec. of State 1892–93; agent of U. S. in Bering Sea arbitration 1893; consulted by Chinese government as to the terms of treaty with Japan 1895.

**Foster,** JOHN WELLS, 1815–1873. Geologist, who studied the Coal Fields of Ohio 1837–44, and was sent with J. D. Whitney to report on the Lake Superior region 1845–52; pres. A. A. A. S. 1869. *Mississippi Valley*, 1869; *Prehistoric Races of U. S.*, 1873.

**Foster,** LAFAYETTE SABINE, LL.D., 1806–1880. U. S. Senator 1855–67; acting Vice-Pres. 1865–67; Judge Conn. Superior Court 1870–76.

**Foster,** MICHAEL, M.D., F.R.S., b. 1836. Prof. Cambridge 1893. *Physiology*, 1876.

**Foster,** STEPHEN COLLINS, 1826–1864. American author of many popular songs, as "Old Folks at Home."

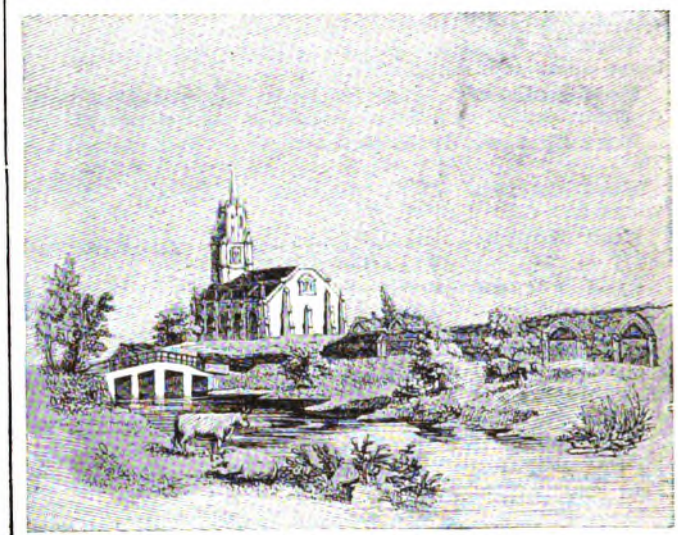
**Foster,** STEPHEN SYMONDS, 1809–1881. American abolitionist.—His wife, ABBY KELLEY, 1811–1887, was active in the same cause.

**Foster,** MRS. THEODOSIA TOLL ("FAYE HUNTINGTON"), b. 1838. American author of juvenile stories.

**Fothergill,** JESSIE, 1856–1891. English novelist. *The First Violin*, 1878; *The Wellfields*, 1880.

**Fothergill,** JOHN, M.D., F.R.S., 1712–1780. English medical writer and philanthropist.—His brother, SAMUEL, d. 1773, was a noted Quaker preacher.

**Fotheringhay.** Village of n. England, with a castle, now ruined, in which Mary Stuart was imprisoned, tried, and executed 1587. It was allowed to fall into decay after the accession of James I. Pop., 1890, 250.



Fotheringhay in 1718.

**Fotheringhay,** TREATY OF. June 10, 1482, between Duke of Albany and Edward IV. of England. Albany was to become King of Scotland under Edward's patronage, to deliver certain lands and castles to England, and to marry Edward's daughter. Edward engaged to aid Albany's designs against Scotland.

**Foucault,** JEAN BERNARD LÉON, 1819–1868. French physicist; with Fizeau he carried on a series of investigations on the intensity of sunlight as compared with that of the electric arc and lime light; also as on the interference of heat rays and on chromatic polarization of light. In 1849 he described a very efficient electromagnetic regulator for an arc lamp, and with Regnault wrote a paper on binocular vision. In 1850, by the use of a revolving mirror, he demonstrated the greater velocity of light in air than in water, and thus established the law deduced from the wave theory that the speed of light in different media is inversely as their refractive indices. In 1855 he was awarded the Copley medal of the Royal Soc. of London for his demonstration of the diurnal motion of the earth, and discovered that a resistance is developed when a copper disk is made to rotate in a magnetic field. His chief papers are in the *Comptes Rendus*, 1847–1869.

**Foucault Currents.** Eddy currents induced by the motion of a non-magnetic conducting body in a magnetic field. Foucault's experiment consisted in rotating a copper disk between the poles of a powerful electromagnet. The induced currents obey Lenz's law, and the mechanical energy expended in continuing the rotation is finally converted into heat, which raises the temperature of the disk.

**Foucault's Experiments** TO SHOW THE EARTH'S ROTATION. The most famous of these was made with a pendulum suspended from the dome of the Pantheon at Paris; the wire by which the ball was suspended was 200 ft. long. The rotation of the earth caused an apparent rotation of the plane of vibration in the opposite direction.

**Foucault's Pendulum.** Adapted to show the earth's rotation. In Feb. 1851 Foucault pointed out that the plane of vibration of a simple pendulum suspended above either pole of the earth would change through an angle $2\pi$ once in every 24 hours. This phenomenon is only apparent, since in fact the plane of oscillation is fixed while the earth rotates beneath the pendulum. If the pendulum be suspended in any latitude $\lambda$, Foucault arrived at the general result that the plane of oscillation will make one complete revolution in $24 \operatorname{cosec} \lambda$ hours. This ingenious experiment attracted great attention at the time, since it afforded direct and independent proof of the rotation of the earth.

**Foucault's Prism.** Modification of Nicol's prism, by which the rhomb is made shorter and the Canada balsam is dispensed with. The critical angles for the two rays in Iceland spar are respectively 37° 14′ and 42° 23′. Hence if the length of the cleft rhomb be so adjusted that the ray shall fall upon the bounding surface at an incidence intermediate between these two, the ordinary ray will be totally reflected, while the extraordinary ray will be transmitted.

**Fouché,** JOSEPH, 1763–1820. French terrorist 1792–95; Minister of Police 1799, and of great service to Napoleon, though twice dismissed; Duke of Otranto 1806; exiled 1816.

**Fougasse.** Mine placed at the bottom of a small shaft, 9 to 12 ft. deep, to be exploded when the enemy is passing over it. A stone fougasse is a mine charged with two or three cubic yards of stone or pebbles, and discharged by the explosion of a powder charge in the direction of the enemy's advance.

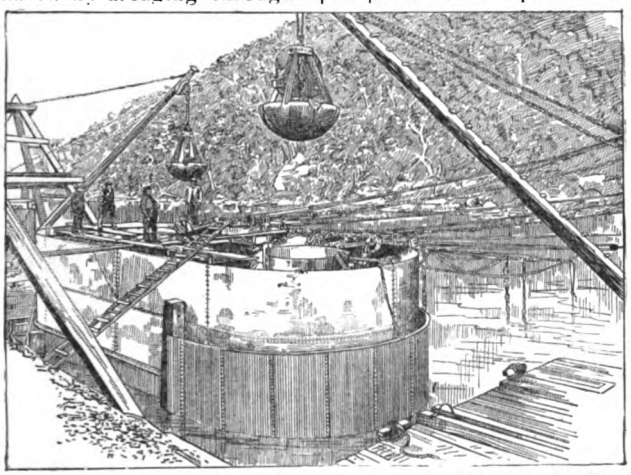
**Foul in the Foot.** See FOOT-ROT or FOUL CLAW. Disease of cattle and sheep in which there is ulceration and suppuration of the tissues between the cleft of the foot, usually of the hind leg, accompanied by fever and loss of condition; it may involve entire foot. It is due to injury, wet pastures, and foreign bodies between the claws, and is best treated by removal to dry place, cleansing of foot, removal of diseased tissues, and use of astringents.

**Fould,** ACHILLE, 1800–1867. French Minister of Finance 1849–52 and 1861–67; Minister of State 1852–60.

**Foulis,** ROBERT, 1707–1776, and ANDREW, 1712–1775. Printers of Glasgow, noted for excellent work; founders of an art academy 1753. Their editions of Horace 1744, and Homer 1756–58, are memorable.

**Foul Raid.** Siege of Roxburgh Castle and Berwick by the Scottish regent, Duke of Albany, 1417, during the absence of Henry V. of England in France. He was forced to raise both with much loss of repute.

**Foundations.** Stone, piles, and iron cylinders are used for foundations of moderate depth. Open caissons are used for depths of water less than 30 ft. Pneumatic piles and caissons have a limit of ab. 100 ft. Deeper foundations are constructed by the crib method, the crib being forced down by the weight of the superstructure, while the mud and earth are removed by dredging through open pockets. The piers of the



Hawkesbury Bridge.—Caisson No. 6 in process of sinking; showing Excavators and Shore Chains for maintaining vertical position.

Hawkesbury Bridge in Australia, the deepest foundations ever constructed, are 161 ft. below the water level. The Poughkeepsie Bridge over the Hudson R. has foundations 130 ft. deep. The largest pneumatic caissons ever constructed were those of the East River Bridge between Brooklyn and New York 102 by 168 ft., one being sunk to a depth of 78 ft. The pressure on the base of an important foundation should not exceed 150 lbs. per sq. inch, and it is usually considerably less; in the Forth Bridge it is ab. 90 lbs. per sq. inch.

**Founder.** Inflammation of the sensitive portion of the feet of horses, mules or asses, which may be due to overwork, especially on hard roads, overfeeding, drinking too much water when heated, or sudden chilling. Poulticing of feet, opium to ease pain, and aconite will usually relieve unless very severe.

**Founding.** Art of casting metals. A wooden pattern is made of the article to be cast, pressing molding sand upon it, producing cavities, which afterward receive the molten metal; occasionally iron molds are used. Slabs and plates are made by pouring molten metal upon a smooth horizontal bed of sand; for others, again, into a mold inclosed on all sides, except two openings to receive the flow. When an article is to be hollow a core of sand with clay is used, which is baked and then introduced into the mold in the proper position. The metal to be used is melted in a cupola furnace, if iron limestone is added as a flux, run into ladles and poured into the mold or is run directly from the tapping hole to the mold. Most articles are cast horizontally, but such articles as cylinders, pipes and shafts are cast vertically and mostly in fits. When the casting has sufficiently cooled it is removed, cleansed from the adhering sand, and the rough edges chipped. See CASTINGS and TYPE FOUNDING.

**Foundling Hospitals.** Institutions where illegitimate or deserted infants are cared for till able to provide for themselves. From the 6th century onward, when children were left in a marble basin in front of the church of Trèves, foundling hospitals were established in all the countries of w. Europe, but turning-boxes for the promiscuous acceptance of infants are now generally abolished.

**Foundry.** Establishment for the fusion and casting of metals.

**Fountain of Youth.** Imaginary spring which, like Eldorado, led the early adventurers on many a fruitless search in the New World. It was said to exist in the land of Bimini, and among others Ponce de Leon hunted for its perpetual health and life-giving waters, and discovered Florida 1513.

**Fountain's Abbey.** Famous Cistercian house founded 1132 near Ripon, Yorkshire, Eng., amid beautiful scenery. Its extensive ruins render its magnificence plainly traceable.

**Fouqué,** FRIEDRICH HEINRICH KARL, BARON DE LA MOTTE, 1777–1843. German poet and romancer dealing chiefly with mediæval themes. *Sigurd*, 1808; *Undine*, 1811; *Theodolf*, 1812; *Magic Ring*, 1816.—His grandfather, HENRI AUGUSTE, 1698–1774, was a noted Prussian general.

**Fouquet,** NICHOLAS, 1615–1680. Marquis de Belle-Isle; superintendent of finances under Louis XIV. 1652–61; charged with malversation, condemned, and imprisoned from 1561.

**Fouquier-Tinville,** ANTOINE QUENTIN, 1747–1795. French terrorist; imprisoned 1794, and executed.

**Fourcroy,** ANTOINE FRANÇOIS, 1755–1809. French chemist, strong antiphlogistonist; Academician 1785; prof. Paris from 1784; Minister of Education 1802. The results of his numerous investigations were pub. in the *Annales de Chimie*.

**Four Doctors,** OF THE LATIN CHURCH. Ambrose, Jerome, Augustine, and Pope Gregory the Great.

**Fourier,** FRANÇOIS MARIE CHARLES, 1772–1837. French socialist, author of *Théorie des Quatre Mouvements*, 1808; *Traité de l'Association*, 1822, and *Nouveau Monde Industriel et Sociétaire*, 1829. His plans have had much influence both in Europe and America.

**Fourier,** JEAN BAPTISTE JOSEPH, 1768–1830. French mathematician and physicist; prof. Paris 1794; in Egypt 1798; prefect of Grenoble 1802–15; Baron 1808; pres. Council of Polytechnic, and Academician 1827. His *Theory of Heat*, 1822, was an epoch-making work. His *Determinate Equations* was edited by Napier 1831.

**Fourierism.** Socialistic scheme developed by F. M. C. Fourier. He proposed the organization of mankind in coöperating groups, called Phalanxes, living in a district and group of buildings which he called a Phalanstery. A society of his followers was formed, and several efforts to put his plans into practice have been made in Europe and America, but all so far have failed.

**Fourier-Motions.** Periodic motion compounded of two or more commensurate simple harmonic motions. Further, Fourier's theorem states that any periodic motion is compounded of a definite number of commensurate simple harmonic motions; and this is true not only of the motion, which may be represented by a more or less complex curve, but also of any phenomenon which this curve may represent.

**Fourier's Series.** Development of a variable in sine and cosine functions of the variable and its multiples.

**Four Masters,** ANNALS OF THE. Irish history 1172–1616; written 1632–36 by Michael O'Clery, a Franciscan monk, and three others; pub. and tr. 1848.

**Fournet,** VICTOR, 1801–1869. French metallurgist and meteorologist.

**Four-O'Clock.** *Mirabilis jalapa.* Marvel of Peru. An-

Four-O'Clock.

nual flowering plant native of Central America. It opens in the afternoon; hence the name.

**Four Point Co-ordinate System.** One which refers any point to its distance from four fundamental planes forming a tetrahedron, and refers a plane to four points, not in the same plane, thus forming the angular vertices of a tetrahedron.

**Fourth Estate.** Class below that of burghers or citizens, who constitute the Third Estate, the first and second being the nobles and clergy. The extension of the suffrage, as in France, has greatly augmented the political power of the working class.—Macaulay called the English press a "Fourth Estate."

**Fovea Centralis.** Depression in the center of the yellow spot of the retina of the eye. It lies almost exactly in the antero-posterior axis of the eyeball, and is the point upon which a ray of light falling gives rise to most distinct vision.

**Foveate.** Organs bearing deep depressions.

**Foveolate.** Diminutive of Foveate.

**Fovilla.** Granular protoplasmic contents of pollen grains.

**Fowl.** See PHASIANIDÆ.

**Fowler,** HENRY HARTLEY, b. 1830. M. P. 1880; Cabinet Minister 1884, 1886, and 1892; Privy Councillor 1886.

**Fowler,** SIR JOHN, LL.D., b. 1817. English civil engineer; builder, with Sir B. Baker, of the Forth Bridge in Scotland; Baronet 1890, on its completion.

**Fowler,** ORSON SQUIRE, 1809–1887. American writer on phrenology.

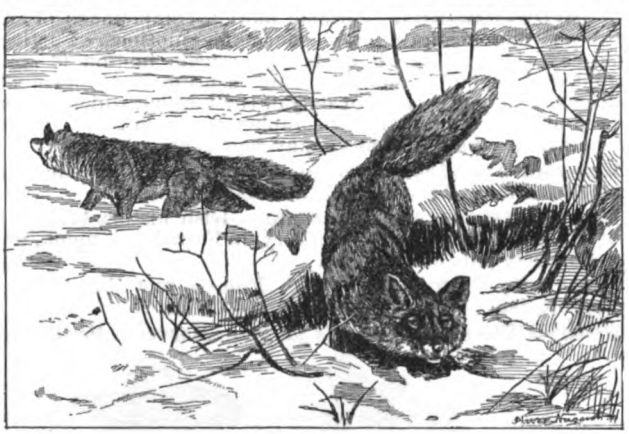
**Fowler,** SAMUEL, M.D., 1799–1844. Geologist and mineralogist; discoverer of fowlerite; M. C. 1833–37.

**Fowler,** THOMAS, b. 1832. Prof. Oxford 1872: biographer of Locke and Bacon. *Logic*, 1867–70; *Morals*, 1887.

**Fowlerite.** Manganese silicate, found at Sterling, N. J., in which a part of the manganese is replaced by zinc.

**Fowler's Solution.** $KH_2AsO_3$. Potassium arsenite. Used in medicine; 80 grains of arsenic trioxide with the same weight of potassium carbonate in one pint of water. It contains 1 per cent arsenic trioxide.

**Fox.** There are 24 living species of foxes. They differ from dogs in being of smaller size, muzzle more pointed, ears always erect, tail very bushy, pupil of eye a vertical slit. When domesticated they form no attachments. The common fox of Europe is 2 ft. long, plus tail, 3 ft., its fur is reddish brown in color, with white tip of tail and black on paws. It feeds on rabbits, birds, shellfish, mice, insects, grapes, etc., 6 young are produced in April in burrows after 2 months' gestation. They are full grown in 18 months, and may live over 12 years. They



Red Fox.

do not interbreed with dogs. The American Red Fox is probably descended from the preceding. Among its varieties is the Black or Silver Fox, whose fur is most valued. In n.w. N. America is the small Coast Fox, black above, cinnamon on side, a variety of the larger and generally distributed Gray Fox. The latter is being exterminated. The African Fennel, a foot long (less tail), is fawn or creamy, with blue eyes, and is sometimes kept as a pet. It preys at night. The fur of the Arctic Fox, brown in summer, turns white in winter, when the skin is highly prized.

**Fox,** CHARLES JAMES. 1749–1806. British statesman and orator; M. P. from 1768; Lord of the Treasury 1773–74; Sec. for Foreign Affairs 1782; Sec. of State 1783. He opposed the foreign policy of Pitt, seconded the efforts of Wilberforce to abolish the slave-trade, aided in the prosecution of Warren Hastings, defended the cause of the American Colonies, and regarded with favor the French Revolution, as the dawn of a new era. *Speeches*, 6 vols., 1815.

**Fox,** GEORGE, 1624–1690. Founder of Quakerism; noted for gifts, virtues, and eccentricities. He began to preach 1648, was imprisoned at least eight times, visited America 1671–72, Holland 1677 and 1684, and left a *Journal*, pub. 1694, *Epistles*, etc., 1698, and *Gospel Truth Demonstrated*, 1706.

**Fox,** GEORGE L., 1825–1877. American actor, successful chiefly in the pantomime *Humpty Dumpty*, prepared 1867 by his brother, CHARLES KEMBLE, 1833–1875.

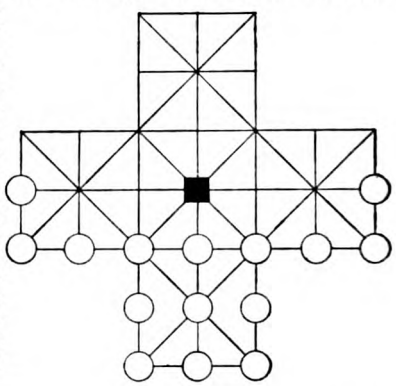
**Fox,** GUSTAVUS VASA, U. S. N., 1821–1883. Asst. Sec. Navy 1861–65.

**Fox,** JOHN. See FOXE.

**Fox,** LUKE, b. ab. 1585. English seaman, who sought a n.w. passage 1631; discoverer of Cumberland Island. His narrative appeared 1635.

**Fox,** WILLIAM JOHNSON, 1786–1864. Deistical preacher in London 1817–52; vigorous political writer; M. P. 1847–57; ed. *Hymns and Anthems*, 1841, in which six notable poems are his. *Works*, 12 vols., 1865.

**Fox and Geese.** Game played upon a board with sixteen pieces, one of which represents the fox and the other fifteen the geese. The fox is placed in the middle of the board and the geese upon the points as shown in the diagram. The geese endeavor to confine the fox to some spot on the board so that there shall be either the edge of the board or two rows of men around him. The fox may jump the geese as in ordinary checkers. The fox may move either forward or backward one square at a time, the geese only forward. Fox and geese is also played upon a chess board with four geese and one fox, the geese being arranged on the four white squares nearest one player while the fox may be placed wherever his owner pleases. One of the practically universal games, played in China, Japan, the Malay Peninsula, and the South Seas, as well as throughout Europe. The old Chinese game, known in Japan at the present day as the game of Sixteen Soldiers, reveals the original significance of the game to have been cosmical and probably divinatory, a conclusion borne out by the nearly corresponding game among the American Indians.



Fox and Geese.

**Foxe,** JOHN, 1516–1587. English martyrologist. He resigned a fellowship at Oxford 1545, retired to the Continent during Mary's reign 1553–59, and became prebendary of Salisbury 1563. His *Acts and Monuments*, 1554–63, gained great fame as the "Book of Martyrs."

**Foxglove.** *Digitalis purpurea.* Showy, pink-flowered herb of the natural family *Scrophulariaceæ*, native of Europe;

Foxglove.

much cultivated as a garden plant. The drug digitalis is derived from its leaves. Other species are known.

**Foxglove,** False. Large, yellow-flowered species of the genus *Dasystoma*, natural family *Scrophulariaceæ*, natives of e. N. America.

**Foxhound.** Probably originally a cross of the old-fashioned hound with the greyhound, producing the greatest existing combination of speed and stamina, and bred specially for fox-hunting. It is of all colors, with black, white, and tan preferred, and should stand ab. 24 in. high.

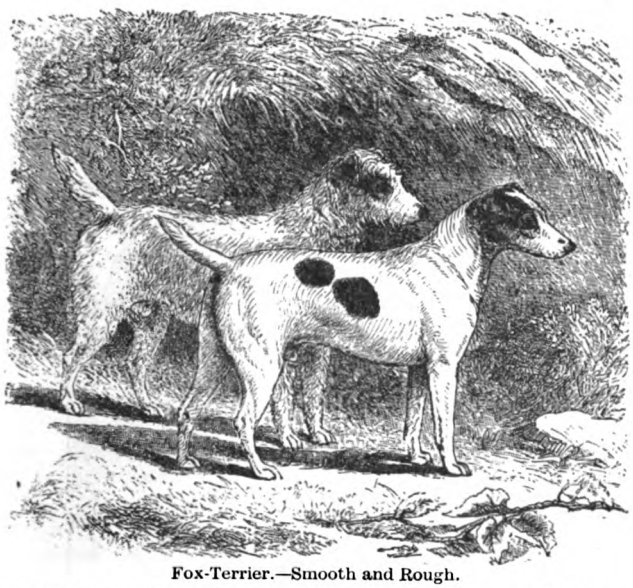
**Foxhunting.** Sport popular in Eng. since the 17th century and introduced into America, India, and the Colonies. The shires are divided into Hunts, and the farmers are paid for damage to crops and poultry by horses and foxes. In 1895 there were 156 packs containing 5,980 couples of hounds in Eng. and Wales, 10 packs with 345 couples in Scotland, and 20 packs with 750 couples in Ireland.

**Fox Indians.** See Sac and Fox Indians.

**Fox-Tail Grass,** Bristly. Species of grass of the genus *Ixophorus*, natives of Europe and Asia, but widely diffused as weeds.

**Foxtail Wedge.** Split iron bolt driven into a hole in a stone, the bottom of the hole being enlarged so that the split is divided by a wedge, thus rendering it difficult to pull out.

**Fox-Terrier.** Small intelligent dog, with white, smooth or rough, coat with black or tan markings, differing from other terriers in its falling ears. The variety was probably first obtained by crossing with the beagle. It is in great favor as a companion and used by sportsmen for going to earth after foxes.



Fox-Terrier.—Smooth and Rough.

**Foy,** Maximilien Sébastien, 1775–1825. French general, distinguished in Spain and at Waterloo: Deputy 1819; noted as a Liberal. *Hist. Peninsular War*, 1827.

**F.P.S. System.** Absolute system of units, in which the fundamental units of length, mass, and time are the foot, the pound, and the second.

**Fraction.** In Arithmetic, collection of fractional units. The value of the unit in reference to unity is given by the denominator, placed below the horizontal line. The number of such units in the collection is given by the numerator, placed above the line. Decimal fractions suppress the denominator, which is determined by the position of the number at the right of units' place. In algebra, a fraction expresses division in which the numerator is dividend, the denominator is divisor, and the fraction itself the quotient. This relation holds also in arithmetical fractions and governs their transformations.

**Fractions,** Rational. Those in which the variable has no fractional exponent. They may be separated into partial fractions of simple form by assuming the given fraction equal to the sum of fractions having as denominators the ultimate real factors of the given denominator, and as numerators undetermined constants, absolute if the denominators involve first degree factors, but associated with the first power of the variable if the denominator have quadratic factors. Multiplying the assumed identity by the given denominator and equating the coefficients of like powers of the variable in the members will determine the assumed constants.

**Fracture.** Breaking of a rigid portion of the body, especially of a bone. Known as simple when the bone does not pierce the skin, compound when it does; complete or incomplete according as the breaking is complete or partial; green-stick when the bone is bent or twisted without separation of the ends; impacted when one portion is driven into the other, and comminuted when the bone is shattered into several fragments. Within a few hours after a fracture has occurred the ends of the bone, if close together, are united by an exudation (callus) which is subsequently converted into true bone. In the young and strong complete union takes place in six or seven weeks, but in the old and feeble may be delayed for months or never occur; in pregnant women union is also very slow. Treatment consists in restoring the part to its normal position and retaining it there by means of splints or bandages made rigid by plaster of Paris, starch, glue, etc. Specially arranged beds are known as fracture beds.

**Fracture Boxes.** Narrow, rectangular boxes for treating fractures of the lower extremities; form of splint.

**Fra Diavolo,** Michele Pezza, 1760–1806. Calabrian brigand, pardoned 1799, commissioned to act against the French, and by them taken and hanged.

**Fragonard,** Jean Honoré, 1732–1806. French genre and decorative painter, somewhat frivolous in tendencies as to choice of subject, but an excellent colorist and a talented draughtsman.—His son, Alexandre Evariste, 1780–1850, was a painter and sculptor.

The Fountain of Love, by Fragonard.

**Fraise.** Obstacle to prevent the escalade of the scarp-wall of a field fortification from the ditch. It is formed of stakes, in near juxtaposition, either slightly inclined or horizontal, imbedded in the parapet and securely attached to it by anchor stakes.

**Frambœsia.** Yaws or pian; tropical and semi-tropical contagious disease of the skin, in which there are reddish, raspberrylike nodules upon the face, extremities, and genitals.

**Frame.** Piece of oredressing machinery on which the ore is washed by a thin sheet of water flowing over a gently inclined surface; rack.

**Framed Structures.** Houses and bridges, whether of timber or metal.

**Frames.** Lining of a military mining gallery or shaft when the pieces are made of planks and supported at intervals by battens. The first, used in constructing a shaft, is the top frame; the others are shaft frames. The sheeting passes outside of the shaft frames and prevents the earth from falling into the shaft from the sides.

**Fra Moreale,** or MONTREAL D'ALBANO, d. 1354. French free lance and brigand chief in Italy, formerly a Knight of St. John; executed in Rome under Rienzi.

**Franc.** Silver coin of France, Belgium, and Switzerland, value 19.3 cents: equal to the lira of Italy, peseta of Spain, and drachma of Greece; monetary unit of these and some other countries.

**Français,** FRANÇOIS LOUIS, b. 1814. French landscape painter.

**France.** Republic of w. Europe, and one of the great powers. Its area is 207,206 sq. miles. Along the e. border are the Alps, and on the s. border the Pyrenees: in the e. part are the Cevennes, Vosges, and other minor mountain ranges: the rest of the country is level or undulating. About half the area is under cultivation, and about half the population is engaged in agriculture. The cereals are the principal crop, and next to them the grape. Manufactures of cotton, woolen, silk and linen goods are very extensive. The mineral resources consist mainly of coal and iron. In 1893 its railroads were 23,871 miles in extent. The value of exports $946,000,000, of imports $1,187,600,000 (1891). Public debt is over $6,000,000,000.

The government is a Republic, with a President elected for 7 years, a Senate, and a Chamber of Deputies. The standing army, 1894, consists of 27,820 officers and 538,707 men. The navy consists, 1894, of 451 vessels, of which 71 are armored. The capital is Paris. Other large cities are Lyons, Marseilles, Bordeaux, Lille and Toulouse. F. has numerous colonies and protectorates, the chief among which are the following, with the population of each:

| | |
|---|---|
| Cochin-China | 1,792,933 |
| Cambodia, Protectorate | 1,500,000 |
| Anam, Protectorate | 6,000,000 |
| Tonkin, Protectorate | 9,000,000 |
| Algeria | 3,817,465 |
| Senegal | 183,237 |
| Tunis, Protectorate | 1,500,000 |
| Madagascar, Protectorate | 3,500,000 |
| Guadalupe | 181,098 |
| Martinique | 169,232 |

F. was anciently Gaul, inhabited by Celts. It was conquered by Cæsar 58 B.C. and permeated with Roman civilization; conquered by Visigoths s. of the Loire and by Franks n., ab. 486. The Merovingians extended their empire to the Pyrenees, and yielded to the Carlovingians 768. Charlemagne's empire extended from the Ebro to the Baltic, and laid the foundation of the European nationalities; from its fragments the Kingdom

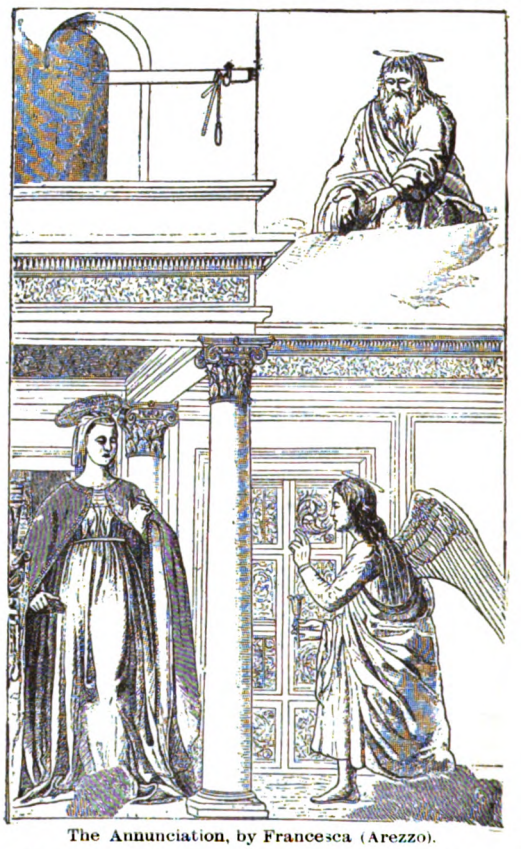
Seal of the First Republic, 1792-1804

of F. emerged under Hugh Capet 987. The work of maintaining a central authority and subjugating the feudal lords occupied the older line; the Valois, 1328–1589, waged the 100 years' war with England, during which the national feeling became greatly intensified, and utilized this feeling in the Italian wars to set the nation upon its career of aggrandizement. Contact with Italy brought intellectual stimulus; the royal authority was increased. The Huguenot wars ended with the accession of Henry IV., 1584. The Bourbons culminated under Louis XIV., 1640–1715, when French influence was predominant in Europe, wealth abundant, armies victorious, territories enlarged, and literature brilliant. A changed policy inspired the latter half of this crucial reign. The Revocation of the Edict of Nantes, 1685, was followed by the extirpation of the industrious Huguenots, wars were unsuccessful, revenues were inadequate to the prodigality of the court, distress was felt. Louis left a debt of 3,500,000,000 livres. Meanwhile the court had absorbed the state. The Estates had not met since 1614. Under Louis XV., 1715–1774, gross maladministration produced distress, and revolutionary ideas were fermenting in society. The cure of the evil seemed to require the removal of the cause, hence the Revolution, which overturned the court and government. A constitution was formed and accepted, but would not work; the Republic was declared Sept. 22, 1792; the King and Queen were deposed and beheaded; the Reign of Terror followed. The Republic under five executive officers (the Directory) fell into confusion; Napoleon was welcomed as a deliverer Nov. 9, 1799, he became Emperor May 18, 1804, and was overthrown at Waterloo June 18, 1815. The monarchy was restored with Louis XVIII. The Bourbons proved unequal to the emergency. Charles X. was forced to abdicate; Louis Philippe accepted the crown 1830 as "Citizen King," a constitutional monarch, but became unpopular and was followed by a second Republic 1848. Louis Napoleon Bonaparte, nephew of Napoleon I., was elected President, and made himself Emperor Nov. 4, 1852; he was overthrown and captured in the Franco-Prussian War 1870, and the third Republic was proclaimed with Thiers as President. It still exists and is growing in stability. Pop., 1891, 38,343,192, or 185 to a sq. mile.

**France,** ANATOLE. See THIBAULT, A. F.

**France,** ISLE OF. See MAURITIUS.

**Francesca,** PIERO DELLA, 1398–1484. Italian painter; a



The Annunciation, by Francesca (Arezzo).

master of great talent in anatomy and perspective. Finest work, the frescoes in the choir of San Francesco at Arezzo.

**Francesca da Rimini,** d. 1285. Slain with her lover by her husband; mentioned in *Dante's Inferno*, and celebrated in G. H. Boker's play.

**Franche-Comté.** Old province of e. France. Besançon was its capital.

**Franchise.** Special privilege granted to a person or body of persons by government, as that of existing as a corporation, and of taking, holding, and enjoying property.

**Francia,** FRANCESCO, 1450–1517. Painter of Bologna, leader of the North Italians outside the Schools of Milan and Padua. He represents the survival of the traditional altar-piece inside the limits of the great period, and was an extremely faithful

FRANCE
French Kilometres 111 = One Degree
0 20 40 60 80 100 120 140
English Miles 69 = One Degree
0 10 20 30 40 50 60 69
DEPARTMENT OF THE SEINE ON ENLARGED SCALE
Fortifications shown thus Forts* Railways
CORSICA
(Corse)
ENGLISH CHANNEL
ATLANTIC OCEAN
BAY OF BISCAY
MEDITERRANEAN SEA
SWITZERLAND
ITALY
CHANNEL ISLANDS
(To England)
GUERNSEY ID.
(British)
JERSEY ID.
ALDERNEY ID.
SCILLY IDS.
Lands End
Lizard Pt.
Start Pt.
Portland Bill
Plymouth
Exeter
Southampton
Coblenz
Mayence
Carlsruhe
Strassburg
Colmar
Mulhausen
Bâle (Basel)
Constance L.
Lucerne L.
Lausanne
Geneva
L. Geneva
Sierre
Milan
Turin
Grenoble
Chambery
Annecy
Chamonix
Gap
Digne
Nice
Toulon
Marseilles
Aix
Avignon
Nantes
Brest
Rennes
Lorient
Vannes
Quimper
Saint Brieuc
Saint Malo
Cherbourg
Le Havre
Rouen
Caen
Dieppe
Calais
Boulogne
Paris
S.Denis
Versailles
Sceaux
Bievres
Antony
Rungis
Orly
Choisy le Roi
Villejuif
Ivry
Bonneuil
Creteil
Charenton
Vincennes
Montreuil
Pantin
Bobigny
Aubervilliers
Saint Denis
Gennevilliers
Colombes
Courbevoie
Nanterre
Puteaux
Suresnes
Meudon
Sèvres
Saint Cloud
Boulogne
Clamart
Chatillon
Bagneux
Gentilly
Arcueil
Bondy
Gagny
Noisy
Rosny
Neuilly sur Marne
Nogent
Brie
Champigny
Saint Maur
Pontoise
Enghien
Pierrefitte
Stains
Dugny
Le Bourget
Drancy
Aubervilliers
Saint Ouen
Clichy
Batignolles
Neuilly
Belleville
Montreuil
Pontenay
Vincennes
Charenton
Champigny
Saint Maur
Creteil
Bonneuil
Choisy le Roi
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Saint Cloud
Boulogne
Puteaux
Nanterre
Courbevoie
Colombes
Gennevilliers
Argenteuil
Epinay

and conscientious artist. Several works of his are in galleries of n. Europe.

**Francia,** José Gaspar Rodriguez, 1761–1840. Dictator of Paraguay from 1814. His administration, a strange mixture of tyranny and wisdom, accomplished much temporary good.

**Franciabigio,** Marcantonio, 1482–1524. Florentine painter, friend and pupil of Andrea del Sarto. His finest work is the fresco of the *Betrothal* in the court of the Annunziata Church at Florence.

**Francillon,** Robert Edward, b. 1841. English novelist. *Earl's Dene*, 1871; *Pearl and Emerald*, 1872; *Under Slieve-Ban*, 1881; *King or Knave*, 1888.

**Francis I.,** of France, 1494–1547. King from 1515. He defeated Swiss at Marignano 1515, was the lifelong rival of Charles V., was defeated at Pavia 1525, and kept prisoner at Madrid a year. The war was renewed 1526–29 and 1534–38. He was a brilliant and picturesque personage, a patron of letters and art, and a persecutor of Protestants.

**Francis II.,** of France, 1543–1560. Son of Henry II., husband of Mary Stuart 1558; King 1559; tool of the Guises. Under him the Huguenot wars began.

**Francis I.,** of Germany, 1708–1765. Duke of Lorraine 1729; Grandduke of Tuscany 1735; husband of Maria Theresa 1736; Co-regent of Austria 1741; Emperor 1745.

**Francis II.,** of Germany, 1768–1835. Son of Leopold II., and his successor 1792. In the Napoleonic wars he lost Belgium and most of Italy 1797, was defeated at Hohenlinden and Marengo 1800, and at Ulm and Austerlitz 1804–5. After the abolition of the German Empire 1806 he became Francis I. of Austria.

**Francis I.,** of Naples, 1777–1830. Son of Ferdinand I.; King 1825.

**Francis II.,** of Naples, b. 1836. Son of Ferdinand II.; King 1859–61.

**Francis,** James Bicheno, 1815–1892. Investigator and constructor of many hydraulic operations; Pres. American Society of Civil Engineers 1881. *Lowell Hydraulic Experiments*, 1855–78.

**Francis,** John Morgan, b. 1823. Founder Troy, N. Y., *Times*, 1851; U. S. Minister to Greece 1871–73, Portugal 1882–84, and Austria 1884–85.

**Francis,** John Wakefield, M.D., LL.D., 1789–1861. Prof. Columbia Coll. 1814–26; medical writer. *Old New York*, 1857–58.

**Francis,** Joseph, 1801–1893. American inventor of lifeboats and iron vessels. He received many honors from Europe and was knighted 1861 by the Czar.

**Francis,** Sir Philip, 1740–1818. M. P. 1784–1807; reputed author of the *Letters of Junius*, 1769–72.

**Francis Borgia,** St., 1510–1572. Duke of Gandia, Spain; General of the Jesuits 1565; canonized 1671.

**Franciscans.** Great mendicant order, called also Minorites and Gray Friars; founded 1210 by St. Francis of Assisi (q.v.).

Franciscan.

**Francis Joseph,** b. 1830. Emperor of Austria 1848. He lost Lombardy 1859, and Venice 1866, through the war with Prussia, but gained Bosnia and Herzegovina by the Treaty of Berlin 1878.

**Francis Joseph Land.** See Franz-Josef Land.

**Francis of Assisi,** St. (Giovanni Bernardone), 1182–1226. Founder of the Franciscans 1210; canonized 1228. His rule was severe; his followers were active evangelists, eminent for zeal and ascetic piety. The order has included many men of note and some great scholars: it has now about 100,000 members. Early branches were the Poor Clares (nuns) 1212, and the Tertiaries 1221.

**Francis of Paula,** 1416–1507. Italian, founder of an order (1436) afterward called Minims, now nearly extinct; canonized 1519.

**Francis of Sales,** St., 1567–1622. Savoyard; Bp. of Geneva 1602; canonized 1665. He converted many Protestants. His *Spiritual Letters* and *Introduction to the Devout Life* have been widely read.

**Francis Xavier,** St. See Xavier.

**Franck,** Cesar Auguste, 1822–1890. Organist and composer of symphonies, chamber pieces, and oratorios. *Les Béatitudes; Ruth.*

**Franck,** Johann, 1618–1677. German hymnist.

**Franck,** Sebastian, 1499–1543. German historian. *Chronica*, 1531–38; *Paradoxa*, 1534; *Sprichwörter*, 1541.

**Francke,** August Hermann, 1663–1727. Pietist and philanthropist; prof. at Halle 1692; founder of a famous orphanage 1698. Two of his hymns are widely used.

**Franco,** Niccolo, ab. 1505–1569. Italian satirical poet.

**Franco de Colonia,** 11th or 12th century. Musical theorist, author of the first known treatise on measured music.

**Franconia.** Old dukedom of w. Germany, chiefly on the Rhine, Main, and Neckar; incorporated 1806 in Bavaria and adjoining states.

**Franconia Mountains.** In N. H.; w. group of White Mountains.

**Franco-German War.** Originated in Napoleon III.'s jealousy of the increasing power of Germany; resolved on by the French July 15, 1870. The French had 300,000 men in the field, the Germans 640,000. Paris capitulated Jan. 28, 1871. Negotiations for peace began Feb. 22; preliminary treaty was signed at Versailles Feb. 26, a final treaty at Frankfort May 10. The Germans lost in dead 28,277; total killed and wounded 127,867. The cost of the war to France was $1,912,000,000. The last German soldier left French soil July 1873, the war indemnity of 5,000,000,000 francs having been paid. The various battles are mentioned alphabetically in this work.

**Francs-Tireurs.** French guerillas 1870; treated by the Germans at first as brigands; later, organized and recognized.

**Franeker.** Town of Friesland, Netherlands; seat of a university, founded 1585, abolished 1810. Here is Eisinga's planetarium, made 1773–80. Pop., 1890, 7,198.

**Frangipani.** Roman family, prominent from ab. 1000.

**Frank,** Franz Hermann Reinhold, D.D., b. 1827. Prof. Erlangen 1857. His *Christian Certainty*, 1870–73, tr. 1886, defends Symbolic Lutheranism.

**Frank,** Jacob, or Jankiew Lebowicz, 1712–1791. Jewish impostor, baptized 1756, imprisoned 1760–63. He set up for Christ, and deceived many in Moravia 1763–86, and then in Hesse, as previously in Galicia.

**Frankalmoign.** Tenure by clergy, as of lands given for sacred uses.

**Frankeniaceæ.** Natural family of flowering plants of the class *Angiospermæ* and sub-class *Dicotyledons*, comprising 3 genera and ab. 130 species, distributed throughout the tropics of America.

**Frankenstein.** Hero of Mrs. Shelley's romance 1818; creator and victim of a monster.

**Frankfort.** Capital of Ky. and of Franklin co.; on Kentucky R. Pop., 1890, 7,892.

**Frankfort,** Council of. Held by Charlemagne and 300 bishops 794. It condemned Adoptionism and Image-worship.

**Frankfort-on-the-Main.** City of Prussia, on the Main, 18 miles above its junction with the Rhine; noted for its literary, scientific, and artistic institutions. It dates from Charlemagne, and was a free city 1257–1866, except 1810–16. Here the German emperors were elected from 1152, and here the treaty of peace with France was signed May 10, 1871. Pop., 1890, 179,850.

The "Römer" at Frankfort-on-the-Main.

**Frankfort-on-the-Oder.** City of Prussia, 50 m. from Berlin. It belonged to the Hanseatic League ab. 1300–1500, was besieged 1430, 1450, and 1477, suffered heavily in the Thirty Years' War, and from the French 1806–11. It had a university 1506–1811. Pop., 1890, 55,738.

**Frankincense.** Fragrant gum-resin used in pharmacy and burned in religious ceremonies. There are several kinds, the best being the Arabian or tear olibanum, the African, and the East Indian or stalactitic. In India it is obtained from *Boswellia glabra*, and the gum-resin of *Canarium strictum* is also fragrant.

**Franking.** Privilege of officials of a government or members of a legislature to send matter through the mails free. Established in England 1660, abolished 1840. In the U. S. it was granted by the Continental Congress to private soldiers, and it has been variously extended and restricted and superseded by official stamps and penalty envelopes. The act of 1891 allowed Members of Congress free use of the mails under their frank to any Government officer when addressed officially.

**Frankland,** EDWARD, LL.D., D.C.L., F.R.S., b. 1825. English chemist, prof. Owens College, Manchester, 1851, and School of Mines, London, 1877–85. *Researches in Pure, Applied, and Physical Chemistry*, 1878.

**Franklin.** Capital of Williamson co., Tenn.; scene of a battle between 27,000 Union troops under Schofield and 55,000 Confederates under Hood, Nov. 30, 1864. Schofield lost ab. 3,000 and withdrew the following night. Confederate loss ab. 7,000. Pop., 1890, 2,250.

**Franklin,** BENJAMIN, LL.D., F.R.S., 1706–1790. Born in Boston; removed 1723 to Phila., where he worked as a printer, founded the Philosophical Society and indirectly the Univ. of Pa., and began his electrical researches 1746; Postmaster-Gen. for the Colonies 1753; in England 1757–62, on a mission as to the taxing of estates, and again 1762, to procure the repeal of the Stamp Act and redress of other grievances; in Congress 1775–76; one of the Committee to frame the Declaration of Independence, and a signer of it; Minister to France 1776–85; Pres. of Pa. 1785–88; Member of the Constitutional Convention 1787. No civilian of his time rendered greater services to America; he was also eminent as scientist, philosopher, and wit. His *Poor Richard's Almanac*, 1732–57, is still read; his *Autobiography* was edited by J. Bigelow 1868, and his complete works in 10 vols., 1886–87.—His son, WILLIAM, 1729–1813, was Gov. of N. J. 1762–76, and a royalist.

**Franklin,** SIR JOHN, D.C.L., F.R.S., 1786–1847. Arctic explorer 1818–19 and 1825–27; Lieut.-gov. of Van Diemen's Land 1834–43. His last expedition with the *Erebus* and *Terror* 1845, was fatal. Over twenty parties went, partly at the urgency of his widow, to learn his fate; the chief relics were found by Capt. McClintock 1858.

**Franklin,** WILLIAM BUEL, U.S.A., b. 1823. Major-gen. of Vols. 1862–65, holding important commands in Va. and on the Gulf, and engaged in many battles. Commissioner-general to Paris Universal Exposition 1889.

**Franklin and Marshall College.** Lancaster, Pa.; chartered in 1852, being a union of Franklin College (established 1787, endowed by Benjamin Franklin) and Marshall College (founded by the Reformed Church at Mercersburg, Pa. 1836). It has 12 professors, 171 students, an observatory, gymnasium, laboratories, and a library of 29,000 vols. Tuition is free. The theological seminary, founded 1825, has 69 students, and 12,000 vols. in its library.

**Franklin Glasses.** Spectacles consisting of lenses of different strength, joined at their edges, the upper one being for observing distant objects, the lower for those near.

**Franklinite.** $(Fe.Zn.Mn)(Fe_2,Mn_2)O_4$. Iron, zinc, and manganese oxides; named from its most prominent locality, near Franklin Furnace, N. J. It has been utilized in many ways, largely as a source of manganese for use in the Bessemer process of steel manufacture. In appearance it is very much like magnetite.

**Franklin's Plate.** Simple form of electric condenser, devised by Franklin. It consists of a rectangular plate of glass in a wooden frame, upon both sides of which sheets of tin foil are fastened, leaving a wide margin all around the edge. By putting one side in communication with the ground and the other with the prime conductor of an electrical machine, the plate may be charged. This device is sometimes known as the Coated Pane.

**Frank-Pledge.** Joint suretyship of the members of the Saxon Tithing, for the peace and good order of the community.

**Franks.** Confederacy of German tribes in 3d century, living mostly on left bank of the Rhine below Alsace. Julian granted them land s. of the Meuse 358, and many took service under the Romans. By 429 they had reached the Loire. They helped at Chalons 451 to repel the invasion of Attila. Under Clovis, 496, the Salian F. became masters of n. Gaul and adopted the Christian faith.

**Franz,** ROBERT, 1815–1892. German musician, chiefly admired for his songs and his additional accompaniments to the works of Bach and Handel.

**Franz-Josef.** See FRANCIS JOSEPH.

**Franz-Josef Land.** Group of islands extending toward the North Pole n. of Nova Zembla, 80–83° N. lat., 50–60° E. long., discovered 1873–74 by Payer and Weyprecht. It is now considered the most favorable final base for reaching the Pole.

**Franzos,** KARL EMIL, b. 1848. German novelist and descriptive writer, son of Polish Jews. *Aus Halbasien*, 1876; *Jews of Barnow*, tr. 1882; *For the Right*, tr. 1887.

**Frascati.** Town of Italy, 13 m. s. e. of Rome; noted for its villas. Here Baronius wrote, Charles Edward Stuart, the Pre-

Villa Falconieri, near Frascati.

tender, died 1788, and Lucien Bonaparte is buried. Pop. ab. 7,500.

**Fraser,** ALEXANDER CAMPBELL, LL.D., b. 1819. Ed. *N. British Review*, 1850–57; prof. Edinburgh 1857; ed. Berkeley's Works 1871. *Rational Philosophy*, 1858; *Locke*, 1889.

**Fraser,** CHARLES, 1782–1860. Painter of Charleston, S. C.

**Fraser,** JAMES, D.D., 1818–1885. Bp. of Manchester 1885; eminent as a thinker, preacher, and administrator.

**Fraser,** SIMON. See LOVAT, LORD.

**Fraser,** THOMAS RICHARD, M.D., F.R.S., b. 1841. Prof. Edinburgh 1877; medical writer.

**Fraser River.** In British Columbia, flowing s. into Gulf of Georgia. Length ab. 800 m.; navigable for 150 m., affording valuable salmon fisheries, and giving access to gold-mines.

**Frasil-Ice.** See GROUND-ICE.

**Fratricelli.** Franciscans who would have no evasion of the vow of poverty. Some of them formed a distinct branch, others ran into violent opposition to the hierarchy and Papacy, or even to historical Christianity. They were condemned 1280 and later, and suppressed ab. 1400.

**Fraud.** Actual fraud includes every willful act by which one unjustifiably deprives another of what he is entitled to: constructive fraud includes acts which the law prohibits because of their tendency to deceive or mislead others, without regard to the actor's intention.

**Frauds,** STATUTE OF. Enacted in Great Britain 1677, to prevent frauds and perjuries in certain contracts and conveyances, and substantially copied by most legislatures in the U. S. It has given rise to a vast amount of legislation. Its provisions and the rules relating thereto evolved by the courts must be sought in the statute books and in special treatises.

**Fraudulent Conveyance.** Transfer of property for the purpose of defrauding the transferrer's creditors or bona fide purchasers; largely regulated by statute.

**Fraunhofer,** JOSEPH VON, 1787–1826. Bavarian optician, especially known for researches by which he laid the foundation of solar and stellar chemistry. The dark lines in the solar spectrum noted by Dr. Wollaston were rediscovered and carefully mapped 1814, the most prominent being designated by the letters of the alphabet.

**Frayssinous,** DENIS ANTOINE LUC, 1765–1841. French priest, eminent as a preacher in Paris 1804–10; made count and minister by the Bourbons.

**Frazee,** JOHN, 1790–1852. American sculptor, noted for his busts of public men.

**Frazer,** PERSIFOR, Ph.D., b. 1844. Mineralogist and metallurgist to U. S. Geological Survey 1868; Prof. Univ. Pa. 1870–74.—His father, JOHN FRIES, LL.D., 1812–1872, was Prof. of Chemistry in Univ. Pa. from 1844.

**Frazier's Farm,** or CHARLES CITY CROSS-ROADS, BATTLE OF. In Va., June 30, 1862. The Confederates gained some

ground, but failed to accomplish their object, the Union forces getting into position for the battle of Malvern Hill the next day.

**Frechette,** LOUIS HONORÉ, LL.D., b. 1839. Canadian poet, writing in French.

**Freckles.** Lentigo; deposit of yellowish or brownish coloring matter in the skin of uncovered portions of the body.

**Fredegar,** SCHOLASTICUS. Frankish chronicler.

**Fredegonda,** d. 597. Wife of Chilperic, king of Neustria. After his death, 593, she waged ruthless war on Brunhilda of Austrasia.

**Frederick.** Capital of Frederick co., Md.; occupied by Confederate troops Sept. 6–12, 1862, and July 9, 1864. Here F. S. Key and R. B. Taney are buried. Pop., 1890, 8,193.

**Frederick I.,** "BARBAROSSA," 1121–1190. One of the most enlightened and powerful of German emperors. He succeeded his father as Duke of Swabia 1147, his uncle, Conrad II., as Emperor 1152. His reign was disturbed by disorders at home, revolts among the Lombard cities, and the pretensions of two rival Popes. He was defeated at Legnano 1176, and agreed, 1183, to leave the Lombard cities to control their own affairs, retaining the right of imposing certain fixed taxes. He humbled his rebellious vassal, Henry the Lion, and crushed the Guelphic power in Germany. In 1189 he set forth for the Holy Land with 100,000 men. After gaining two victories over the Saracens he was drowned in Asia Minor. His memory is cherished as that of a national hero.

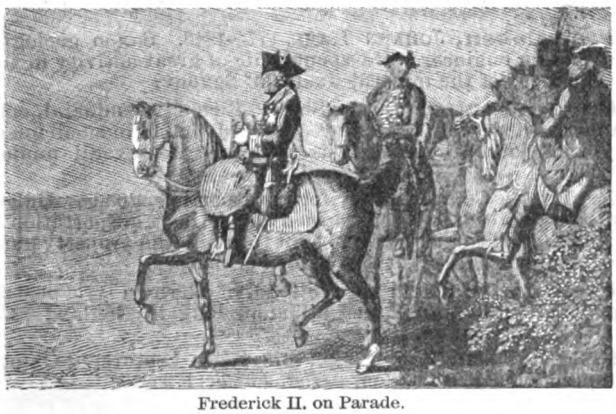
**Frederick II.,** OF GERMANY, 1194–1250. Son of Henry VI., grandson of Frederick I.; Emperor 1215; the most accomplished sovereign of the Middle Ages, and one of the most unfortunate; a poet and patron of learning. He went to the Holy Land 1228 and was crowned in Jerusalem 1229. The popes hated, steadily opposed, and four times excommunicated him; his son Henry rebelled 1235; other rivals arose; the Danes extended their power around the Baltic; constant disturbances in north and south made his seven crowns as many burdens.

**Frederick III.,** OF GERMANY, 1415–1493. Emperor 1440; a studious man, little given to affairs of state, and much to the advancement of his family. His reign was marked by many losses and disasters.

**Frederick I.** Duke 1411, and Elector 1415, of Brandenburg; previously F. VI. of Hohenzollern. This was the beginning of the Prussian State.

**Frederick I.,** OF PRUSSIA, 1657–1713. Elector of Brandenburg 1688, King 1701; founder Univ. of Halle and Berlin Academies of Science and Art.

**Frederick II.,** OF PRUSSIA, "THE GREAT," 1712–1786. Son of Frederick William I., and long victim of his father's tyranny. On his accession, 1740, he at once showed great political and military abilities. He gained high reputation in the Silesian and Bohemian wars, 1741–45, and devoted the ensuing years of



Frederick II. on Parade.

peace to national improvements and to literature. The Seven Years' War, 1756–63, increased his fame. His dominions were enlarged by the acquisition of Silesia and the partition of Poland, 1772. He left a strong government, a full treasury, and a disciplined army. He was much influenced by Voltaire, and his writings, all in French, were pub. in 31 vols., 1846–57.

**Frederick III.,** "THE GOOD," 1831–1888. Son of William I., son-in-law of Victoria of England; distinguished in the wars with Austria and France, especially at Weissenburg and Wörth; Field-marshal 1870; King of Prussia and Emperor of Germany March 9–June 15, 1888. His noble character and liberal opinions commanded general respect and affection.

**Frederick III.,** OF SAXONY, "THE WISE," 1463–1525. Elector 1486; friend and protector of Luther.

**Frederick III.,** OF THE PALATINATE, "THE PIOUS," d. 1576. Elector 1559. He took the Calvinistic side, and substituted the Reformed for the Lutheran faith in his dominions.

**Frederick V.,** PRINCE PALATINE, 1596–1632. Elector 1610; son-in-law of James I. of England 1613; King of Bohemia 1619–20; defeated at Prague 1620, and thenceforth in exile. In 1623 his electoral title and dominions were declared forfeited.

**Frederick V.,** OF DENMARK, 1723–1766 King 1746; encourager of commerce and the arts.—His grandson, FREDERICK VI., 1768–1839, became Regent 1784 and King 1808, and promoted several reforms. Under him Denmark suffered much from England and the Allies, and lost Norway 1814.—His cousin, FREDERICK VII., 1808–1863, King 1848, was the last of the Oldenburg line.

**Frederick,** PRINCE OF WALES, 1707–1751. Son of George II. and father of George III.

**Frederick Charles,** PRINCE, 1828–1885. Prussian general, nephew of William I.; prominent in the Austrian and French wars, victor at Königgrätz and Metz; Field-marshal 1870.

**Frederick William I.,** 1688–1740. King of Prussia 1713; noted for his eccentricities, his economies, and his tall guards. He left a treasure and a strong army to the son whom he had persecuted.

**Frederick William II.,** 1744–1797. Nephew of Frederick the Great; King 1797. Prussia gained much territory 1793–95, not by his good management, but by the partition of Poland.—His son, FREDERICK WILLIAM III., 1770–1840, King 1797, lost half his dominions after Jena, 1806, and showed a sad lack of character and capacity. The reforms of Stein, the liberation of Germany, and the recovery of what Napoleon had taken, were not his work: his personal policy was either imbecile or reactionary.—His son, FREDERICK WILLIAM IV., 1795–1861, King 1840, attempted despotism, provoked the revolution of 1848, and reluctantly granted a constitution 1850. His mind failed 1857.

**Frederick William,** OF BRANDENBURG, 1620–1688. Elector 1640. He repaired the devastations of the Thirty Years' War, repelled foreign enemies, developed home resources, welcomed exiled Huguenots, and prepared his country for its future greatness as the kingdom of Prussia.

**Frederick William,** OF BRUNSWICK, 1771–1815. Duke 1806; active against Napoleon; in the service of England 1809–13; killed at Quatre Bras.

**Fredericksburg.** City of Spottsylvania co., Va., on the Rappahannock. Here the Union forces under Burnside were defeated by Lee, Dec. 13, 1862, with loss of nearly 13,000 men; Lee's loss was over 5,000. Pop., 1890, 4,528.

**Free Agent.** One in a position to choose between right and wrong, and able to do either at his will.

**Free Baptists.** Sect organized in N. H. ab. 1780. They reject Calvinism and close communion, have included several lesser bodies, and now number ab. 85,000.

**Free Church of Scotland.** Organized 1843 by Dr. T. Chalmers and over 400 ministers, seceding from the Kirk. It now has ab. 1,100 congregations and 350,000 communicants, with several foreign missions.

**Free Cities of Germany.** Cities holding directly of the Empire. During the confusion of the Middle Ages, they gained, or maintained, independence of the princes in whose territory they lay, partly by defensive leagues, partly by imperial privileges. Many of them had votes in the Diet. Their number fluctuated. At the Diet of Augsburg they were divided into two benches, Swabian and Rhenish. They became third collegium of the Diet 1648, and numbered 51 in 1789. By decision of the imperial deputation, 1803, only 6 were allowed to hold directly of the Empire. After 1866 only Hamburg, Lubeck and Bremen retained their freedom.

**Free Coinage.** Government policy of coining into standard pieces of money all bullion brought to its mints, charging only the actual cost of coinage, or performing the service gratis. Recently it has come to refer especially to the coinage of silver as well as gold at a given ratio.

**Free Competition.** Absence of combination among buyers or sellers in any open market, economic equality of position among them, and abstention from interference on the part of government.

**Free Congregations.** Formed in Germany 1841 by 16 rationalist ministers. In 1891 they numbered 55, with nearly 19,000 members.

**Freedmen.** Liberated slaves in ancient Rome and since, as in the U. S. after 1863.

**Freedmen's Bureau.** Branch of U. S. War Department, established March 3, 1865. It had the control of all matters "relating to refugees and freedmen from any district embraced

within the territory covered by the operations of the army." It protected the rights of freedmen, provided work, and medical treatment, and established schools for their higher education.

**Freedom.** Immunity from interference on the part of others, especially when considered as the fundamental principle of ideal justice and law.

**Freedom of Will.** Capacity of choosing between good actions and bad in such a way as to be responsible for the results of one's choice.

**Free-Fall.** Contrivance, several forms of which have been used, for letting the drill-end of the tools employed in deep borings fall independently of the rod or cable that reaches to the surface.

**Free Goods.** Goods provided by nature without requiring the effort of man, and not appropriated by man; *e.g.*, land in an unimproved state and in an unsettled country, fish in the sea, wood, unappropriated forests, minerals under unclaimed land, and natural oyster beds.

**Freehold,** ESTATE OF. That held by a freeman, and hence one of inheritance or for life.

**Free Imperial Cities.** See FREE CITIES OF GERMANY.

**Free-Lances.** Hireling soldiery of the Middle Ages; called in Italy Condottieri, and from 1487 in Germany Landsknechte. They were of all nationalities.

**Freeman,** EDWARD AUGUSTUS, LL.D., D.C.L., 1823–1892. English historian, prof. Oxford 1884. Besides his chief work, *History of the Norman Conquest*, 5 vols., 1867–76, he wrote on *The Saracens*, 1856; *English Constitution*, 1872; *Ottoman Power in Europe*, 1877; *William Rufus*, 1882, and other subjects. His exhaustive *History of Sicily* was left incomplete; Vol. IV. appeared 1894.

**Freemasonry.** Organization the members of which profess to be bound together by certain mystic ties and the exercise of charity, truth, mutual help, and brotherly love. It is masonic only in its phraseology and symbolism. Although fancifully traced back variously to Solomon's Temple, the Tower of Babel and the Ark, modern Freemasonry originated in England in the 17th century. In U. S. and British America 770,120 members 1895.

**Free Methodists.** Sect in U. S. and Canada, with ab. 700 ministers and 26,000 members in the former.

**Free Milling.** Ore from which gold and silver can be obtained directly by amalgamation.

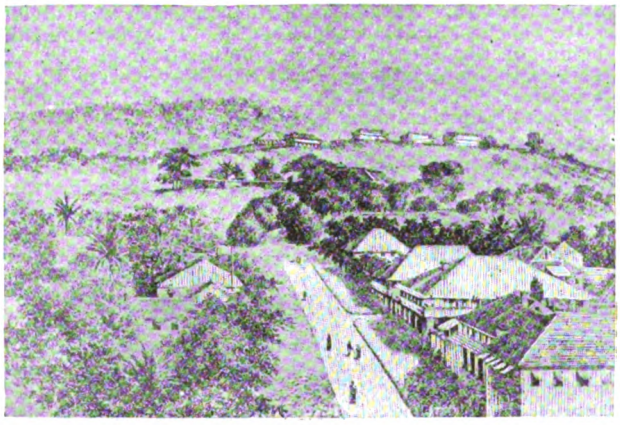
**Freeport.** Capital of Stephenson co., Ill., 121 m. w. of Chicago. Pop., 1890, 10,189.

**Free Soil Party.** Formed 1848 on the failure of the WILMOT PROVISO (q.v.) to pass Congress and its rejection from the political platforms of both the Whig and Democratic parties. A convention at Buffalo nominated Van Buren for Pres. 1848; he received 291,000 votes. In 1852 the party nominated John P. Hale for Pres., but polled only 157,000 votes. In 1856 it was absorbed by the Republican party.

**Freestone.** Any stone that is easily quarried and worked by ordinary tools into desirable shapes; commonly a sandstone.

**Freethinkers.** Those who claim the moral right of thinking on religion or ethics without the guidance of authority; in common parlance, usually deists.

**Freetown.** Capital of Sierra Leone; founded 1787. Originally called Granvilletown. It is ab. 5 m. from the Atlantic



Freetown.

and overlooks the unhealty marsh known as Kroo Bay. The temperature is tolerably uniform and the climate unhealthy, especially to Europeans. Pop. ab. 30,000, mostly Africans.

**Free Trade.** Absence of any import duties laid with the object of encouraging domestic industry. More technically, a policy of entire abstention by government from any interference with economic production, distribution, or exchange.

**Free Will.** See VOLITION.

**Free Will Baptists.** See FREE BAPTISTS.

**Freezing Method.** For laying foundations in quicksand by freezing the sand and water and thus preventing it from flowing into the excavation. Pipes are laid in the quicksand through which a freezing mixture is forced by pumps.

**Freezing Mixtures.** Substances used to produce artificial cold. The commonest mixture is snow or ice and salt, 3 to 1 giving —21° C. Finely ground, crystallized calcium chloride mixed with snow or ice 2 to 1, gives —15° C. Ammonium nitrate and chloride, 2 to 1 with 3 of water give —5° C. These quantities are by weight.

**Freiberg.** Mining town of Saxony, founded 1175; in the Erzgebirge, among mines of copper, lead, tin, and silver. It has extensive smelting works and a celebrated mining-school. Pop. 1890, 28,955.

**Freiburg.** Town of Baden, on w. edge of Black Forest; founded 1091. It has a fine cathedral, built 1122–1513, and a university, founded 1455, with ab. 900 students. Pop., 1890, 48,909.

**Freiburg,** or FRIBOURG. Capital of Swiss canton Freiburg; 17 m. s.w. of Berne, on both sides of the Saane, the opposite

Freiburg.

sides of which are connected by a suspension bridge. It has a R. C. university and a church with a noted organ. Pop., 1888, 12,244.

**Freiesleben,** JOHANN KARL, 1774–1846. Saxon geologist and mining engineer. He spent a life of great activity in the development of the mineral wealth of Saxony.

**Freieslebenite.** $Pb_2Ag_3Sb_3S_6$. Rich silver mineral, containing also sulphur, antimony, and lead; found in small quantity with other argentiferous minerals in several mining districts.

**Freight.** Compensation for transporting goods. Unless otherwise agreed, it is not earned until the transportation is finished. The carrier has the right to retain the property until then, and has a lien on all of it for his charges.

**Freiligrath,** FERDINAND, 1810–1876. German lyric poet of republican views, prosecuted 1848, and long in England. *Ca Ira*, 1846; *Revolution*, 1848.

**Freind,** JOHN, M.D., F.R.S., 1675–1728. Lecturer at Oxford and practitioner in London. *Hist. Physic*, 1725–26.

**Freinsheim,** JOHANN, 1608–1660. Prof. Upsala 1642–47, and Heidelberg 1656; ed. Florus, 1632, Q. Curtius, 1640, and the fragments of Livy's lost books.

**Freire,** RAMON, 1787–1851. Dictator of Chili 1823–28; banished 1831–42.

**Freire de Andrada,** GOMEZ, 1685–1763. Gov. of Rio Janeiro and adjoining provinces from 1733; Count of Bobadella 1757. He did much to develop the country, as his cousin and namesake, 1636–1702, had done in n. Brazil from 1685.

**Freischütz.** Hunter of German legend, in league with Satan; celebrated in Weber's opera.

**Frejes,** FRANCISCO, d. 1845. Mexican monk, historian of the conquest.

**Frejus.** Town of France, on the Mediterranean; colonized by Greeks from Marseilles, and later by Cæsar as Forum Julii;

birthplace of Agricola. It once had a fine harbor. Hence Napoleon was sent to Elba 1814. Pop., 1891, 2,634.

**Frejus,** COL DE. See MONT CENIS.

**Frelinghuysen,** THEODORE, LL.D., 1787–1861. U. S. Senator from N. J. 1829–35; chancellor Univ. N. Y. 1839–50; pres. Rutgers Coll. from 1851; Whig candidate for Vice-Pres. 1844.—His father, FREDERICK, 1753–1804, was a revolutionary officer, and U. S. Senator 1793–96; his nephew, FREDERICK THEODORE, 1817–1885, was U. S. Senator 1866–69 and 1871–77; Sec. of State 1881–85.—Their ancestor, THEODORUS JACOBUS, ab. 1691–1747, came from Holland 1720, and was an active missionary in N. J.

**Fremiet,** EMMANUEL, b. 1824. French sculptor.

**Fremont,** JOHN CHARLES, U. S. A., 1813–1890. As lieut. of engineers he began the exploration of the Rocky Mountain region 1842. By 1845 he had determined much of the geography of the Western U. S. He was prominent in the conquest of CALIFORNIA (q.v.), surveyed the route for a road from the Mississippi to San Francisco, and was U. S. Senator from Cal. 1849–51. In 1856 he was the first Republican candidate for the Presidency, and received 114 electoral votes. He served as maj.-gen. of vols. 1861–64. *Memoirs*, 1886.

**Fremont's Peak.** Highest summit in Wind River Mts., Wyoming. Altitude 13,790 ft.

**French,** ALICE ("OCTAVE THANET"). Author of stories and sketches, chiefly relating to Ark. and Iowa. *Knitters in the Sun*, 1887.

**French,** DANIEL CHESTER, b. 1850. American sculptor, best known at the World's Fair, Chicago, for which he executed the colossal Republic and the majority of the staff sculptures in the Court of Honor, including the Quadriga of the Peristyle. In these works he was assisted by Potter, who did all the animal work. F.'s relief, *Death and the Sculptor*, was shown in the Art Palace, and takes first rank in contemporary sculpture of that type.

**French and Indian War.** Struggle between the French and English, 1752–60, for the possession of N. America. The French settlements, mainly through the industry of Jesuit missionaries, extended from Canada to the mouth of the Mississippi, and it was attempted to confine England to the coast, the special matter in dispute at the beginning of the war being the possession of the Ohio valley. The war resulted in the cession of Canada to England, France retaining Louisiana until 1762, when it was ceded to Spain, and France lost her last foothold on the American continent.

**French Broad.** River of w. N. C. and e. Tenn., tributary to the Holston near Knoxville; ab. 200 m. long; noted for its fine scenery.

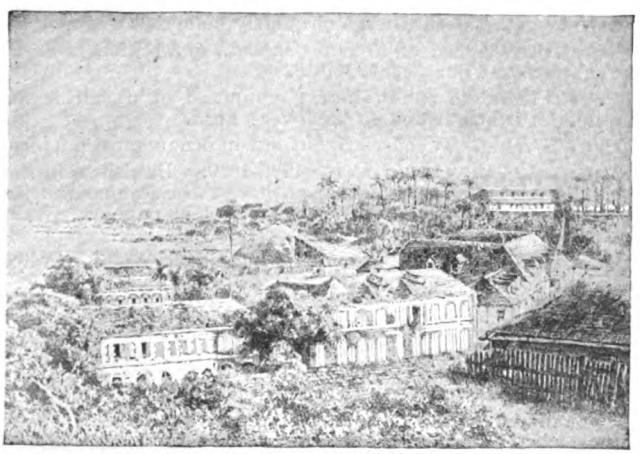
**French Chalk.** Fine-grained or compact variety of talc.

**French Claims Commission.** Court authorized by act of Congress Jan. 1885, to examine and report upon claims for damages done to American shipping by the French prior to the Convention of July 1801.

**French Coach.** See HORSE.

**French Draft.** See HORSE.

**French Guiana.** In n. part of S. America. The country is low and flat near the coast, rising into plateaus and mountains inland. Efforts to colonize it have been mainly failures;



Cayenne, capital of French Guiana.

it has been several times taken by the Dutch and English, and is now a convict station. The capital is Cayenne, founded 1634. Area 46,840 sq. m.; pop., 1890, 25,796.

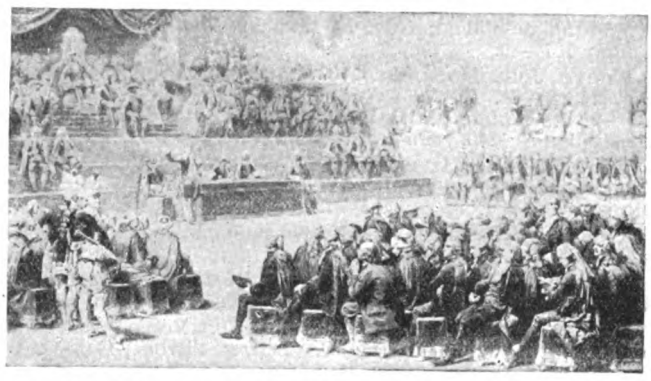
**French Horn.** Orchestral instrument developed out of the old hunting horn, still called Waldhorn, or Forest Horn, by Germans. It is a simple brass tube, ab. 17 ft. long, widening rapidly to a bell at one end, and, for convenience in handling, arranged in spiral convolutions. By means of crooks the length of the tube is changed and its pitch raised or lowered. The compass of the instrument varies with each change. Formerly the tones which were not the natural resonances of the harmonic divisions of the tube were helped out by inserting the hand into the bell of the horn which raised its pitch. Valves are now used, but the old method is still at times resorted to.

**French Language.** Now the language of all the people of France; once the dialect of the country about Paris. Along with other dialects (mainly the Provençal or *langue d'oc*) it is descended from the popular Latin spoken by Romanized inhabitants of Gaul. It is thus one of the Romance Languages. Among the earliest monuments of French is the oath taken by the French army at Strassburg in 842. The vigorous period of the dialects extends to the 14th century, when modern French may be said to begin.

**French Literature.** This falls naturally into three principal divisions, marked by changes in the language, ideas, and institutions of the country. The first extends 1100–1500. To this belongs the poetry of the Trouvéres and Troubadours. In it were produced the *Chansons de Gesté*, among which the *Chanson de Roland* is prominent. There is found also a class of poems called *Les Bestiares*, descriptive of animals, and another *Les Fables*. It is the *Chanson* in its different forms which is most prevalent and most notable. There was also formed an allegorical poetry of which the *Roman de la Rose* is the most elaborate. In prose the chronicles of Froissart, and in drama the miracle play or mystery make up the sum of achievement. The second period, or that of the Renaissance, extending over the 16th century. It was the Reformation period in France as well as in Germany. Only a few great names appear, chiefly those of Montaigne and Rabelais. Ronsard and his School refined and polished the language. Still it was the age of preparation rather than of achievement, as in German literature. Modern French Literature, the third period, covers the last three centuries. Boileau, Corneille, Moliere, the great writers of the age of Louis XIV., usher in its brilliant career. Since it began its course it has never flagged. It was the literature of France which in the 18th century largely contributed to the Revolution, through the writings of Voltaire, Rousseau, and the Encyclopedists. Its vigor is undiminished, and the 19th century, while producing a host of shining names, with Balzac and Hugo in the van, has shown the perfection of literary art.

**French Prophets.** Camisard enthusiasts who claimed the gift of languages, miracles, divination, and healing. They had considerable following in England ab. 1706, but their pretensions were soon exploded.

**French Revolution.** Uprising of the people against the oppression of despotic absolutism. The causes were the prevalent distress, the exemption of the privileged classes, the flagrant abuses of administration, the corruption of the court, the new doctrines of the Encyclopedists, and the example of the American Republic. Louis XIV. left a debt of 3,500,000,000 livres, an exhausted country, an intolerable system of taxation, and a demoralized civil service. Louis XV. made ineffectual



Opening of the States-General at Versailles, 1789. (Painted by Couder.)

efforts to ward off bankruptcy, and Louis XVI. convoked the estates, May 25, 1789, in which the general dissatisfaction was reflected. The 3d estate protested against the vote by class instead of by poll, constituted itself the National Assembly (June 17), and invited the other two estates to unite with it. It demanded a Constitution; the king replied by summoning troops. An insurrection broke out in Paris July 12; the Bastile was stormed July 14. The mob of Paris massacred the royal

guard Oct. 5, and secured the persons of the king and queen: the king accepted the new constitution July 14, 1790, and the Legislative Assembly met Oct. 1, 1791. Meanwhile the hostility of Austria, the reverses of the army, and the more determined attitude of the king caused the wildest excitement. The Tuileries were invaded, and the royal family imprisoned. The Republic was proclaimed Sept. 21, 1792, Radicals (Jacobins) and Constitutionalists (Girondists) divided the National Convention; Jacobins gained the ascendency, and, angered by royalist intrigues and inflamed by the success of the army, sought to

Napoleon Overthrowing the Directory, Nov. 9, 1799. (Painted by Bouchot.)

carry out their radical principles, and executed the king Jan. 21, 1793, and the Girondist leaders Oct. 31. The mob now ruled, the Reign of Terror began, the Christian religion was abolished, and "Reason" enthroned. With the fall of Robespierre, July 28, 1794, a reaction began; a Directory of five was constituted to establish order; a fresh revolt of the mob was suppressed by Napoleon, and his brilliant victories made the Republic respected abroad. But the Directory proved incapable of administering the state, and the country approved of its overthrow and assumption of supreme power by Napoleon Nov. 9, 1799.—Minor revolutions occurred 1830 and 1848, overthrowing Charles X. and Louis Philippe; temporarily re-establishing the Republic.

**Freneau,** PHILIP, 1752–1832. American journalist, essayist, and poet; active in satirizing the British and the Federalists.

**Frenum.** Cheek stripe in birds.

**Frère,** CHARLES THEODORE, b. 1815, and his brother, PIERRE ÉDOUARD, 1819–1886. French painters.

**Frere,** SIR HENRY BARTLE EDWARD, D.C.L., 1815–1884. Anglo-Indian official; Gov. of Bombay 1862–67, and of Cape Colony 1877–80.

**Frere,** JOHN HOOKHAM, 1769–1846. English poet, uncle of Sir Henry; M. P. 1796–1802; Minister to Spain 1802–4 and 1808–9; resident in Malta from 1821. *King Arthur*, 1817; tr. Aristophanes 1840. His works were collected 1871.

**Frère-Orban,** HUBERT JOSEPH WALTHER, b. 1812. Belgian Liberal; Minister of Finance 1847, 1848–52, and 1861–68; Prime Minister 1878–84.

**Freret,** NICOLAS, 1688–1749. French philosopher, geographer, Orientalist, and grammarian.

**Frerichs,** FRIEDRICH THEODOR, 1819–1885. Prof. Breslau 1852; medical writer, as on *Diseases of the Liver*.

**Fréron,** ÉLIE CATHERINE, 1718–1776. French journalist and critic, opponent of Voltaire. *Lettres*, 13 vols., 1749–54.

**Fresco.** Painting on fresh or wet plaster, oldest and long ascendant method of wall painting in the Middle Ages, especially in Italy. Strictly, it implies use of water color on damp surface, but is also extended to wall painting on dry surface and with any medium for color. Fine frescoes were executed in the Romanesque cathedrals of northern Europe before the rise of the art in Italy, which dates from the 14th century, but these have almost wholly disappeared. In Italy Giotto was the first epoch-making master of the art. He was succeeded by Massaccio, who first developed a realistic style. The greatest fresco painters were of the 16th century, especially Raphael and Michelangelo. Leonardo da Vinci was their forerunner.

Fresco, from Pompeii.

The art of fresco was widely practiced in antiquity; the finest remains, aside from some in Rome, are in the Naples Museum from Pompeii or still on the walls of that buried city.

**Frescobaldi,** GIROLAMO, ab. 1583–1644. Italian musician, celebrated as performer on and composer for the organ.

**Fresenius,** CARL REMIGIUS, b. 1818. German chemist, assistant under Liebig at Giessen 1841; prof. at Weisbaden 1848; best known by his text books on qualitative and quantitative analysis 1841–46. He founded the *Zeitschrift für Analytische Chemie*, 1862.

**Fresnel,** AUGUSTIN JEAN, F.R.S., 1788–1827. French physicist; Academician 1823. His researches in optics began ab. 1814. The wave theory of light was extended to a large class of optical phenomena and permanently established by his discoveries and mathematical deductions. He received high compliments from Arago, Laplace, and Biot. His papers, pub. in the memoirs of the Academy of Sciences, the bulletins of the Société Philomatique, and the Annales de Chimie, were collected 1866–70.

**Fresnel's Rhomb.** Device for obtaining circularly polarized light. It consists of a rhomb of St. Gobain glass having acute angles of 54° 30′. A beam of plane polarized light incident perpendicularly, or nearly so, upon one of the faces, its plane making an angle of 45° with that of reflection, suffers two total reflections, and emerges parallel to its original direction, but circularly polarized. This is due to the fact that at each reflection one of the rays into which the incident light may be supposed to be resolved suffers a change of phase of $\frac{1}{8}$ of an undulation. The total retardation then is $\frac{1}{4}$ of a wave length, and when two light rays, polarized in planes at right angles to each other, interfere with a difference of phase of $\frac{1}{4}$ of a wave length, the result is a circularly polarized wave.

**Fresno.** Capital of Fresno co., Cal., in a region of farms and vineyards. Pop., 1880, 10,818.

**Fret.** Heraldic sub-ordinary, composed of a saltier and mascle. It is also called a true lover's knot.

**Fret Work.** Wood-work cut out in ornamental patterns.

**Freund,** HERMANN ERNST, 1786–1840. Danish sculptor, noted for mythological themes; author of the Ragnarok frieze in the palace at Christiansborg, 1827.—His nephew, GEORG CHRISTIAN, b. 1821, is also a sculptor.

**Freund,** WILHELM, b. 1806. German author of Latin lexicons, the chief of which was pub. in 4 vols. 1834–45.

**Frey,** or FREYR. In Norse mythology, god of pleasure and fertility, dispenser of wealth.—His sister, FREYA or FREIJA, was goddess of love, sends sunshine, rain, and harvest, and has charge of the dead, especially of half the heroes who fall in battle. See FRIGA.

**Freycinet,** CHARLES LOUIS DE SAULCES DE, b. 1828. French engineer; Senator 1876; Minister of Public Works 1877–79; Premier 1879, 1882, and 1886; Minister of War 1889; Member Academy of Sciences 1882, Institute 1890.

**Freylinghausen,** JOHANN ANASTASIUS, 1670–1739. German hymnist, A. H. Francke's son-in-law and assistant at Halle.

**Freytag,** GEORG WILHELM FRIEDRICH, 1788–1861. Prof. Bonn 1819; writer on Arabic literature and history; ed. Lokman's *Fables*, 1823. *Lexicon Arabico-Latinum*, 4 vols., 1830–37.

**Freytag,** GUSTAV, 1816–1895. German dramatist and novelist; ed. *Grenzboten* (Leipzig), 1847–70. *Debit and Credit*, 1855; *Pictures of German Life*, 1862; *The Lost Manuscript*, 1864; *Our Ancestors*, 6 vols., 1872–81. His works, collected 1886–88, fill 22 vols.

**Friars.** Members of monastic orders, chiefly Dominicans (black), Franciscans (gray), Carmelites (white), and Augus-

Barefooted Carmelite Friars.

tinians. Monks not priests are called friars in Ireland, of whatever order; but after taking priest's orders they lose this distinctive name.

**Frias,** TOMAS, 1805–1884. Bolivian Sec. of State 1841–46 and 1858–60; Pres. 1874–77.

**Frich,** JOACHIM GYLDENKRANTZ. 1810–1858. Norwegian painter.

**Friction.** Resistance to the relative motion of two surfaces in contact. It is of two kinds, sliding and rolling. Sliding friction may be either kinetic or static, according as there is or is not motion. The ratio of the force F required to start sliding, to the normal pressure P between the surfaces, is called the Co-efficient of Static Friction, usually represented by u. The resultant of F and P makes an angle $\delta$ with the normal; this angle is called the Limiting Angle of friction for the two surfaces. Evidently $u=\frac{F}{P}=\tan\delta$. The maximum angle $\phi$, formed by an inclined plane with the horizontal at which a rough body placed upon the plane will rest without sliding, is called the Angle of Repose. If the weight of the body be resolved into two components, one perpendicular to the plane representing the normal pressure P, the other parallel to the plane and representing the force F which starts sliding, we see that $\frac{F}{P}=\tan\phi$; but $\frac{F}{P}=u=\tan\delta$, hence $u=\frac{F}{P}=\tan\phi=\tan\delta$. The Laws of Friction were enunciated by Coulomb 1781 and confirmed by Marin 1830. They are: 1, friction is proportional to the intensity of normal pressure between the surfaces (*i.e.*, pressure per unit area); 2, it is independent of the surface area in contact; and 3, of the velocity of the surfaces in contact. These laws are found to be true practically only within certain limits. Again, when the surfaces have been in contact a long time, the action of the surface layers of molecules upon one another is so far changed as to very considerably increase the co-efficient of static friction u. The co-efficient of kinetic friction is somewhat less for high velocities. The friction of motion is less than that which exists when the body has to be started from rest. Lubricants fill the interstices and keep the contact surfaces apart. The following are some of the usual co-efficients of unlubricated friction: cast iron on cast iron .15, wrought iron on wrought iron .14, brass on brass .20, wrought iron on cast iron .19, brass on iron .16. For lubricated friction it is difficult to formulate laws. When thick unguents are used, as for heavy pressures, a resistance is offered by the lubricant to motion upon the surfaces, corresponding somewhat to fluid friction. For light pressures and limpid lubricants, differences result from different methods of supplying the latter. It would seem from recent experimentation that the following values could be depended upon: light pressures, 30 to 40 lbs. per sq. in., 300 fpm., from .01 to .04; heavier pressures, 100 to 500 lbs. per sq. in., from .02 to .10 (fpm. = feet per minute).

**Friction Gear.** Form of driving gear in which smooth surfaces without transverse serrations are simply pressed together so that the follower is moved by its friction at the contact with the driver. The contact surfaces are either plain cylinders or disks, or else they are grooved in the direction in which slipping would take place. In the first case, the driver will be of some material a little softer than the follower, so that if the follower is of cast iron the driver will have a wood, leather, rubber, or paper face. In the second case, the grooves are made with straight inclined sides, so that a certain pressure to bring the wheels together exerts a greater normal pressure on the sides of the groove. The advantage of this form of driving gear is that the machinery can be started with less shock, and an excessive resistance is followed by slipping of the gear instead of breakage of some part.

**Friction Primer.** Two copper tubes soldered at right angles to each other. The short tube contains a charge of friction composition surrounding the roughened end of a wire, the outer extremity of which forms a loop for the lanyard; the long tube, for insertion into the vent, is filled with fine powder, retained by a wad of wax. This primer is used for a radial vent; for the axial vent of the field piece, model of 1890, an obturating primer is used.

**Friday.** Sixth day of the week, named after Freya, the Scandinavian Venus. The Romans called it dies Veneris. In the Middle Ages it was supposed to be the most changeable day of the week.

**Fridolin,** ST. Caledonian Celt of 6th century, reputed earliest apostle of Germany.

**Friesland.** Most northerly province of Holland. Area 1,282 sq. m. Pop., 1889, 337,507.

**Friedland.** Town of e. Prussia, scene of Napoleon's victory over the Russians and Prussians June 14, 1807. The French

Battle of Friedland (by Simeon Ford, Versailles Gallery).

lost 10,000 men, the Allies 18,000 and 80 cannon. The Peace of Tilsit followed. Pop., 1890, 2,609.

**Friedland.** Town of Bohemia, which gave Wallenstein his title of Duke. Pop., 1890, 5,282.

**Friedland,** VALENTIN, 1490–1556. Rector of a great school at Goldberg, Silesia, 1523–27 and 1531–54; memorable in the history of education.

**Friedländer,** DAVID, 1750–1834. Jewish reformer in Berlin.

**Friedländer,** MICHAEL, b. 1833. Head of the Jews' Coll. in Berlin 1865; editor of many rabbinical books.

**Friedrich,** JOHANN, D.D., b. 1836. Prof. at Munich since 1865; associate of Dr. Döllinger in the Old Catholic movement. *Ch. History of Germany*, 1867–69; *Vatican Councils*, 3 vols., 1877–87; *Jesuits*, 1881.

**Friendly** (or TONGA) **Islands.** Group of ab. 180, coral or volcanic, in s. Pacific, lat. 13–25° S., long. 73–77° W.; discovered 1643, named 1777 by Cook. Their neutrality was guaranteed 1886; 32 are inhabited, the rest minute. The largest, Tongatabu, has 128 sq. m. Total area ab. 385 sq. m.; pop., 1890, 22,000, and dwindling.

**Friends,** or QUAKERS. Society founded by George Fox ab. 1650, and long persecuted; remarkable as rejecting the external sacraments, setting the inward light above Scripture, and essential far above ceremonial righteousness. They disallow oaths and all use of arms against men. Members in Great Britain and Ireland ab. 20,000, in America ab. 100,000.

**Friendship.** Form of affection toward one who does not claim it as relative or fellow-citizen, or merely on grounds of common humanity.

**Friends of God.** Swiss and German mystics ab. 1360–1420, whose tenets and history are obscure. Among them were Tauler, Eckart, John of Chur, and Nicholas of Basel.

**Fries,** ELIAS MAGNUS, 1794–1878. Swedish botanist; prof. Lund 1819, Upsala 1834. *Novitiæ Floræ Suecicæ*, 1828; *Systema mycologicum*, 1821–29; *Lichenographia Europæa reformata*, 1831; *Summa vegetabilium Scandinaviæ*, 1846–49.

**Fries,** JACOB FRIEDRICH, 1773–1843. German philosopher: prof. Heidelberg 1805–16, Jena 1816–19 and from 1824; critic of Kantianism. *Neue Kritik der Vernunft*, 1807; *Psychie Anthropologie*, 1820–21.

**Frieze.** Thick woolen cloth with coarse heavy nap made originally in Friesland and principally worn by the lower orders.

**Frieze.** In Classic Architecture, the middle division of an entablature, between the architrave and the cornice. In the Doric style it is divided by triglyphs into metopes, often covered

Frieze of the Temple of Apollo at Phigalia.

with sculpture. In the Ionic and Corinthian styles it is continuous, and is sometimes covered with a running band of carved ornament. The term is also applied to the upper division of a wall, either exterior or interior.

**Friezing Machine.** Wood-working machine with rapidly revolving steel cutters, which are ground so as to cut a desired profile on the edge of a strip. There are usually two vertical spindles turning opposite ways, or one spindle which can be reversed. The reversal of direction is necessary in working on curved work where the grain will be reversed, and the cutting must not come so as to lift the fibers. Such machines are also called shapers, and are used in chair-factories, and in making curved picture-frames.

**Friga.** In Norse mythology, wife of Odin; knowing all things, controlling all nature, presiding over marriage; sometimes wrongly identified with Freija. See FREY.

**Frigate.** Double-decked man-of-war in size between a sloop and line-of-battle ship, mounting from 28 to 44 guns. In modern ships the name is applied to those having guns on the decks instead of in turrets.

**Frigate Bird.** Of the order *Steganopodes;* intertropical sea-bird, noted for its power of flight, both as to distance and speed. The wings are very long, the tail forked. Each bird lays a single egg of the size of a hen's egg, in rude nest. They associate in rookeries in the Bahama Islands, and do not catch fish.

**Frigid Zones.** Geographical divisions of the earth's surface lying within the arctic and antarctic circles, comprising an area of ab. 8¼ million sq. m.

**Frimann,** CLAUS, 1746–1829, and PEDU HARBO, 1752–1839. Norwegian poets, brothers.

**Fringe Tree.** *Chionanthus virginica.* Delicately white-flowered shrub of the Olive family, native of the s.e. U. S.

**Fringillidæ.** Finch family, including a very large number of species of small birds, distinguished by short, stout, conical bill and corners of mouth drawn down. Most are singers, and a few have brilliant plumage. They feed on seeds, fruit, grain and buds, and includes Buntings, Canaries, Crossbills, Finches, Grosbeaks, Linnets, and Sparrows. See CONIROSTRES.

**Fringing Reef.** Incipient form of barrier reef. It dif-

Fringing and Barrier Reef.

fers from the barrier reef in being smaller and nearer shore. See BARRIER REEF and CORAL REEF.

**Frische Haff.** Prussian lagoon, area ab. 310 sq. m., lying s. of Gulf of Dantzig. The Baltic broke into it 1510. It receives the Pregel, two arms of the Vistula, and other streams.

**Frisi,** PAOLO, 1728–1787. Prof. Pisa 1756 and Milan 1764; writer on mathematics and physics.

**Frisian.** See CATTLE.

**Frisian Language.** Language of the n.w. part of Germany, along the coast, including parts of Holland, Oldenburg, Hanover, and certain islands. It was once of great extent, and is important as the nearest relative of Anglo-Saxon. Its literary monuments are chiefly laws and legal forms dating from the 14th century, together with folk-songs and other literature in modern times.

**Frisians.** Inhabitants of Friesland, n. Holland. Formerly the whole coast of the North Sea from Jutland to West Flanders with the islands adjacent was occupied by them. Since the first century, when they became known to the Romans, both their numbers and their geographical area appear to have been gradually diminishing.

**Frith,** JOHN, 1503–1533. English reformer and martyr, in exile 1528–32; burned at Smithfield.

**Frith,** WILLIAM POWELL, R.A., b. 1819. English painter. His *Derby Day*, 1858, *Railway Station*, 1862, and other large groups are familiar.

**Fritsch,** CARL, 1812–1879. Director of the Central Institute for Meteorology and Terrestrial Magnetism at Vienna: author of many Memoirs on Phænology and Climatology.

**Fritsch,** JOHANN, b. 1849. Austrian writer on neurology.

**Fritz,** SAMUEL, 1653–1728. Bohemian Jesuit, missionary in Peru and along the Amazon, of which he pub. a map 1707.

**Fritzcke,** CHRISTIAN FRIEDRICH, 1776–1850. Prof. Halle 1830; theological writer.—Of his sons, FRANZ VOLKMAR, b. 1806, prof. Rostock 1828, edited several Greek classics: OTTO FRIDOLIN, D.D., b. 1812, prof. Zurich 1837, ed. Lactantius 1842–44, and O. T. Apocrypha 1871.

**Frioli.** Old Lombard duchy at head of the Adriatic; now partly Italian, partly Austrian. Total area ab. 3,470 sq. m.; pop. ab. 700,000.

**Froben,** JOHANN, 1460–1527. Printer at Basel from 1491; publisher of Erasmus' Greek Testament and other works, and of sundry Latin Ch. fathers.

**Froberger,** JOHANN JACOB, d. 1667. Organist, pupil of Frescobaldi.

**Frobisher,** SIR MARTIN, ab. 1535–1594. English navigator, who sailed June 1576 in search of n.w. passage to China, and passed through Frobisher's Strait Aug. 11. He made other voyages in 1577–78, went with Drake to the West Indies 1585, fought against the Armada, and was knighted 1588.

**Froebel,** FRIEDRICH WILHELM AUGUST, 1782–1852. German teacher in Thuringia and for a time in Switzerland; founder of Kindergartens 1836. He took much from Pestalozzi and other reformers, but went far beyond them. His principles, substituting for formal instruction the free development of the faculties through object-lessons and work, have been generally adopted. *Die Menschenerziehung*, 1826; *Mütter- und Kose-lieder; Works*, 1862–63; *Autobiography*, tr. 1886.—His nephew, JULIUS, 1805–1893, prof. Zurich 1833–44, was a traveler, journalist, and author. *Politik*, 1847–61.

**Frog.** See PHANEROGLOSSA and FIRMISTERNIA.

**Frog.** Iron or steel block used at the place where one railroad rail crosses another. The number of a frog expresses how

Frog.

many times the width of the broad end of the tongue is contained in its length. The usual frog numbers are from 4 to 12.

**Frog Angle.** Included between the two sides of the tongue of a railroad frog. The cotangent of one-half this angle is the number of the frog.

**Frog-Fish.** See ACANTHOPTERI, LOPHIUS, and PEDICULATI.

**Froissart,** JEAN, 1337–ab. 1415. French historian and poet. His *Chronicles*, tr. by Lord Berners 1523–25, and by T. Johnes 1803–5, shed much light upon the manners of his time.

**Frölich,** LORENZ, b. 1820. Danish artist, widely known by his illustrations of H. C. Andersen's and other juvenile books.

**Fromentin,** EUGÈNE, 1820–1876. French genre painter, especially of Oriental scenes.

Falconry (by E. Fromentin).

**Frond.** Leaves of ferns, thallus of algæ and lichens, and some *hepaticæ*.

**Fronde.** Party in France, which in the minority of Louis XIV., 1649–52, waged civil war with the Court and Cardinal Mazarin, led by Condé, Conti, and other great nobles. They were compared to street gamins who hurl a stone and then run to escape the police.

**Frondose.** Similar or related to a frond.

**Frontal Bone.** Single bone which forms the forehead and front and upper part of the head.

**Frontenac,** LOUIS DE BUADE, COMTE DE. 1620–1698. Gov. of Canada 1672–82 and from 1698. He took an important part in colonizing the Mississippi Valley and in defending the French possessions against the inroads of the British, and sent his Indian allies to ravage New England, suppressed the Iroquois, and repelled an attack on Quebec 1690; probably the ablest Frenchman ever in power in America.

**Frontier.** Border or limit of any territory, not facing the sea, but fronting another country. Frontiers were anciently called Marches.

**Frontinus,** SEXTUS JULIUS, ab. 40–103. Latin writer of whom two works are extant, one on military science, the other on the Roman aqueducts.

**Fronto,** MARCUS CORNELIUS, ab.100–ab.175. Roman grammarian; tutor of Marcus Aurelius; Consul 143. He left a series of letters and some grammatical fragments, discovered by Cardinal Mai 1815.

**Fronto-Nasal Process.** See NASO-FRONTAL.

**Frossard,** CHARLES AUGUSTE, 1807–1875. French general who served in Algeria, the Crimea, and Italy. He commanded the second army corps in the Franco-German War, was defeated at Spicheren Aug. 6, 1870, made prisoner at Metz Oct. 27, and pub. a report of the operations of his corps 1871.

**Frost.** 1. Temperature below freezing. 2. Formation of frozen needles of ice or snow on the exposed side of leaves and plants, usually at night, in clear cold weather. 3. Formation of frozen vapor precipitated from the atmosphere, and usually forming regular branching figures.

**Frost Batter.** Slope made near the top of a back of a retaining wall so as to lessen the thrust caused by the freezing of the earth.

**Frost Bites.** Usually white and cold, and without sensation; soon reddening of the surface occurs, which may be followed by blisters, ulcers or gangrene. Part should be rubbed gently, in the cold air, and, after circulation has been restored, protected by cotton and greased. Treatment of ulcers, etc., is the same as when occurring under other circumstances.

**Frost Jacket.** Hollow cylinder surrounding a hydrant to protect it from frost.

**Frost-Weed.** *Helianthemum majus.* Yellow-flowered plant of the Rock-rose family, native of e. N. America.

**Frost Work.** Extensive accumulation of frozen atmospheric vapor forming on the windward side of objects, usually on mountain tops.

**Froth Fly.** *Aphrophora spumaria.* Yellowish-green insect, ab. one-half an inch long, and usually found on willows. Name applied to numerous insects parasitic on plants, on which the larvæ and pupæ are found surrounded by a frothy spittle. Related to the Lantern flies.

**Frothingham,** NATHANIEL LANGDON, D.D., 1793–1870. Unitarian pastor in Boston 1815–50; hymnist and translator. *Metrical Pieces*, 1855–70.—His son, OCTAVIUS BROOKS, 1822–1895, pastor in N. Y. 1859–79, has pub. lives of Theodore Parker, 1874, Gerrit Smith, 1878, Geo. Ripley, 1882, and W. H. Channing, 1886. *Transcendentalism in New England*, 1876; *Boston Unitarianism*, 1890; *Recollections*, 1891.—His sister, ELLEN, b. 1835, has tr. works of Lessing, 1868–74, and Goethe, 1870.

**Froude,** JAMES ANTHONY, LL.D., 1818–1894. English historian and essayist; prof. at Oxford 1892; biographer of Carlyle, 1882–84, Beaconsfield, 1890, and Erasmus, 1894. His chief work is a *History of England, 1529–88*, 12 vols., 1856–69. *Calvinism*, 1871; *English in Ireland*, 1874; *Oceana*, 1886; *Divorce of Catherine*, 1891; and a novel, *Two Chiefs of Dunboy*, 1889.

**F's,** THE THREE. Fixity of Tenure, Fair Rent, and Freedom of Sale of Tenant Right; a familiar party cry in the agitation for changes in the land system of Ireland. The first meant the right of the tenant to keep the land as long as he continued to pay a Fair Rent for it. This meant a rent estimated from the production of the land, not fixed by competition. Free Sale meant the right of the outgoing tenant to dispose of the good will; *i.e.*, the privilege of having the farm for what it was rented at before.

**Fructidor.** Twelfth month in French republican calendar of 1792, Aug. 18–Sept. 16. On 18th Fructidor, year 5, *i.e.*, Sept. 4, 1797, an anti-royalist coup d'etat occurred in the Directory.

**Fructification.** Fruiting of plants, properly only of the *Spermatophyta*, but widely used in allusion to the sporanges of the cryptogamous plants.

**Frugality.** Such habits of care with regard to sparing and spending as may tend to avoid poverty and privation.

**Frugivora.** See BATS.

**Frugoni,** CARLO INNOCENZO, 1692–1768. Italian lyric poet.

**Fruit.** Ripened pistil or pistils of a flower, and organs adhering thereto.

**Fruit Ethers.** Organic salts of the fat acids. They all possess very agreeable odors and taste. See ETHYL ACETATE, AMYL ACETATE, etc.

**Fruit Pigeon.** *Carpophagus oceanica.* Genus of *Columbidæ*, having highly-colored plumage, green being the prevailing color; the bill depressed at the base, and the membrane in which the nostrils are pierced slightly swollen. It is found in the Indian Archipelago, and islands of Pacific Ocean, and lives mostly on fruit, whence the name.

Fruit-Pigeon

**Fruit Sugar.** See LÆVULOSE.

**Frumentius,** ST., d. ab. 360. Bp. of Axum 326; apostle of Abyssinia.

**Frundsberg,** GEORG VON, 1473–1528. German captain of landsknechte in Italian wars.

**Frustranea.** Order of the Linnæan class *Syngenesia* (natural order *Compositæ*), having the disk flowers perfect, but those of the rays neutral, as in the Sunflower.

**Frustule.** Individual diatom; also its silicious cell-wall.

**Frustum.** Portion of a solid included between planes, usually parallel, cutting the solid. In the pyramid and cone the frustum is included between the base and a plane parallel to it.

**Frutemtaceous.** Cereal plants.

**Frutescent.** Perennial herbs which are more or less woody at the base.

**Fruticose.** Resembling a shrub; herbaceous plants which are slightly woody; also certain forms of the thallus in lichens.

**Fruticulose.** Diminutive of fruticose.

**Fry,** Mrs. Elizabeth (Gurney), 1780–1845, m. 1800. English Quaker philanthropist, laboring especially among female prisoners. *Letters and Journal*, 1847.

**Fry,** James Barnet. U.S.A., 1827–1894. Provost-marshal-gen. 1863–66. *Report*, 1866; *History of Brevets*, 1877.

**Fry,** William Henry, 1815–1864. American journalist, musical critic, and composer of four symphonies and two operas, *Leonora*, 1845, and *Notre Dame de Paris*, 1864.

**Frye,** William Pierce, b. 1830. M. C. from Me. 1871–81; U. S. Senator since 1881.

**Fryxell,** Anders, 1795–1881. Swedish historian and poet. Parts of his *Tales from Swedish History*, 18 vols., 1832–52, were tr. into English, German, French and Dutch. His book defending the aristocracy, 4 vols., 1845–50, caused much controversy. He wrote an opera, *The Lass of Varmland*.

**Fuad Pasha,** Mehmed, 1814–1869. Turkish Minister of the Interior 1849; between 1852 and 1867 four times Minister of Foreign Affairs; Grand Vizier 1861; in charge of finances 1862.

**Fuca,** Juan de, d. 1602. Greek seaman in the service of Spain. In 1592 he discovered the strait named from him, between Washington and Vancouver Isl.; he supposed it to connect the Pacific with the Atlantic.

**Fucaceæ.** Order of Algæ of the sub-class *Phæophyceæ*, including most of the large, dark-green species, as the rockweeds, gulf-weed, and devil's apron.

**Fuchs,** Ernst, b. 1851. Austrian ophthalmologist, prof. Liége 1881, and Vienna from 1885. Some of his books have been tr. into French and English.

**Fuchs,** Johann Nepomuk von, 1774–1856. German mineralogist and chemist; prof. Landshut 1807; ennobled 1854.

**Fuchs,** Leonhard, 1501–1566. German herbalist; prof. Tübingen. *De historia stirpium commentarii insignes*, etc., 1542; *Neue Kreuterbuch*, 1543; *Läbliche Abbildung und Contrafaytung aller Kreuter*, 1545.

**Fuchsia.** Genus of showy-flowered shrubs of the natural

Fuchsia globosa. Fuchsia fulgens.

family *Onagraceæ*, natives of S. America and Mexico, extensively cultivated as ornamental plants.

**Fuchsine.** $C_{20}H_{20}N_3Cl$. Rosaniline hydrochloride. The rosaniline is produced by the oxidation of a mixture of aniline and toluidine, or by heating aniline and toluidine with nitrobenzene and nitrotoluene. The fuchsine is prepared by the union of the base and hydrochloric acid. It consists of green crystals, easily soluble in water, giving a red solution, and is used as a red coloring matter and in the manufacture of other coal-tar colors. See Acid Magenta and Aniline Red.

**Fuchsite.** Variety of mica containing chromium.

**Fucino,** or Celano, Lake. E. of Rome, in the Apennines, ab. 2,180 ft. high; area anciently 61 sq. m. To check its overflow a tunnel 3½ m. long was dug 44–54 by the labor of 30,000 men. This was soon clogged; it was restored and enlarged 1852–62 by Montricher, a Swiss engineer; the cost, over $6,000,000, was borne by Prince Torlonia. By 1875 the lake-bed was dry.

**Fucoids.** Fossil sea-weeds; found in rocks from the Laurentian upward.

**Fucoxanthin.** Principal coloring matter in the dark-green Algæ, rock-weeds, etc.

**Fucus Amylaceus.** *Gracilaria lichenoides.* Vegetable jelly yielded by a red sea-weed, native in the Indian Ocean.

**Fuegans.** Indian tribe at s.w. extremity of S. America and on adjacent islands. They number 7,000, and are short, especially in the legs. Feet are large, and big toe is widely separated from the others. The face is flat, the nose sunken, short, and with distended nostrils. They are somewhat Es-

Alakaluf Fuegans, dressed in Huanaco Skins.

kimo-like in lacking a lobe to the ear. The complexion is brown-yellow. They are nomadic fishers, keep a fire burning in their canoes and live wretchedly. They have no chief; and scarcely any clothes, even in winter. A few have accepted Christianity. They are polygamous, marry early, the wives are bought, and the women do most of the work.

**Fuel.** Any substance which can be usefully and economically employed for the production of heat by combustion with air. Fuels are solid, liquid, and gaseous. The solid fuels are anthracite or hard coal, bituminous or soft coal, lignite or brown coal, peat, turf, coke, charcoal, wood, brushwood, cotton stalks, straw, refuse sugar-cane or bagasse, spent tan bark, the dried dung of camels, horses, and oxen. The liquid fuels are the natural oils, petroleum or naphtha, and the heavy residue from their distillation, called petroleum refuse, creosote oil or dead oil; also fish-oil and blubber. The gaseous fuels are natural gas, either such as escapes from cracks in the ground near naphtha wells, or the gas from deep bored wells, such as those of the U. S.; also artificial gas produced by the partial combustion of solid fuels (producer gas), or by their distillation (illuminating gas), or by passing steam through incandescent fuel (water gas).

The economic value of a fuel depends on its price, its ease of combustion, the quantity and quality of its ash, its heating power. The price is governed by its abundance, ease of obtaining, cost of bringing to the market. As to ease of combustion some fuels ignite and burn easily (bituminous coal), others have to be dried (peat), and others require particular forms of apparatus to burn them safely (naphtha residue). As to the ash, too large a proportion may render the fuel unfit for use by diminishing its heating effect and clogging the grate; further, for certain metallurgical purposes, phosphorus and sulphur must be small in amount in the ash, or the product will have its quality deteriorated.

The heating effect is all-important. It is usually expressed in heat units, each unit being the amount of heat required to heat one kilogramme of water one degree Centigrade. Thus the calorific value of pure carbon is 8,080 calories, which means that the heat evolved in the combustion of any given weight (as one kilogramme) of carbon would raise the temperature of 8,080 times that weight of water one degree Centigrade, or 8,080 $\times\frac{9}{5}$=14,544 kilos one degree Fahrenheit. The principal constituents of fuels are carbon, hydrogen, oxygen, water, and ash; only the first two are combustible, and only as much of the hydrogen as is not already combined with the oxygen present. The calorific power is determined experimentally by burning the finely-powdered fuel in compressed oxygen gas in the "calorimetric bomb," which is immersed in water and the heat thus measured; or, practically, by finding out how much water the burning of a given weight of fuel will evaporate. Another simple method, giving reliable comparative results, is that of mixing the powdered fuel with litharge, heating to redness in a closed crucible, and comparing the weights of the lead buttons obtained, which vary directly as the calorific powers of the fuels.

The following table gives the actual calorific powers as obtained in the calorimetric bomb, also the theoretical and the practical evaporative powers. The figures represent average values:

| Kind of fuel. | Calorific power in calories. | Evaporative power in kilos: Theoretical. | Evaporative power in kilos: Practical. |
|---|---|---|---|
| Anthracite Coal | 9,000 | 14.6 | 9.0 |
| Bituminous " | 8,000 | 12.5 | 7.0 |
| | 10,000 | 15.7 | 10.0 |
| Brown " | 6,000 | 9.4 | 5.0 |
| Peat | 3,000 | 4.7 | 3.3 |
| Coke | 7,600 | 11.9 | 10.3 |
| Charcoal | 8,000 | 12.6 | 9.0 |
| Air-dried Wood | 3,000 | 4.7 | 3.6 |
| Brushwood | 2,500 | 3.7 | 2.5 |
| Cotton-stalks | 2,700 | 4.2 | 3.0 |
| Straw | 2,400 | 3.5 | 2.4 |
| Bagasse | 2,900 | 4.5 | 3.3 |
| Spent tan-bark | 2,500 | 3.7 | 2.0 |
| Camel's dung | 2,000 | 3.1 | 1.8 |
| Crude petroleum / Naphtha residue | 10,000 | 15.7 | 12.0 |
| Natural gas | 12,200 | 17.5 | 15.0 |
| Illuminating gas | 12,500 | 19.6 | 18.0 |
| Water gas | 4,200 | 5.8 | 5.0 |
| Producer gas | 900 | 1.4 | 1.3 |

The practical efficiency of liquid and gaseous fuels is nearer the theoretical efficiency than in the case of solid fuels, because they can be more perfectly consumed.

**Fuentes de Onoro.** Village of w. Spain; here Massena, attempting to relieve Almeida, was defeated by Wellington, May 3–5, 1811.

**Fueros.** Old local codes and municipal charters of n. Spain, chiefly in the Basque provinces; in force till the second Carlist war 1872–76. Similar codes and customs existed in s. France till ab. 1800.

**Fugacious,** or EPHEMERAL. Parts of a flower which continue only for a day, as the petals of the Poppy; also leaves or other organs of short duration.

**Fugger.** Family of merchants and bankers at Augsburg, who rose to vast wealth and many dignities; ennobled by Maximilian 1504; made princes of the empire by Charles V. and later emperors.

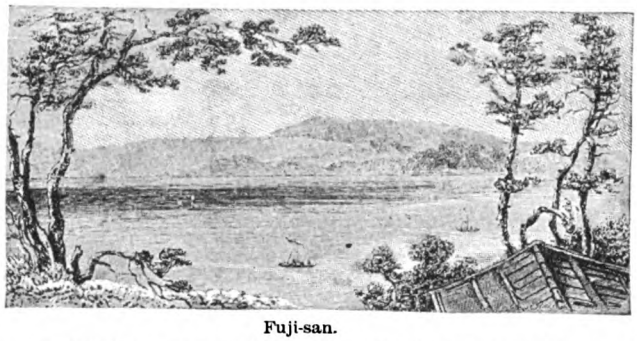
**Fugitive Slave Law.** Several laws have at different times been enacted by Congress for the enforcement of certain provisions in the Constitution directing the rendition of fugitive slaves. The act of 1793 provided that this surrender should be made on authority of Federal judges or local State magistrates. In 1850 a more stringent measure was enacted, by which slaves were to be arrested and returned by specially appointed U. S. Commissioners and by U. S. marshals. Authority was also granted to the owner of a fugitive personally or through an agent to make arrests of slaves wherever found and bring them before a commissioner or judge, who must give summary judgment and order the return of the slave at once, if satisfied of the validity of the claim.

**Fugue.** Musical composition in which the parts enter successively, a subject, stated by one voice, being imitated in turn by the other voices. Named from *fuga*, a flight, since the parts seem to be flying before or pursuing each other. The principal constituents are subject, answer, counter-subject, strettos, and episodes. J. S. Bach was the greatest writer of fugues.

**Fuh-hi.** Legendary founder of the Chinese polity, usually assigned to the period 2852–2738 B.C. He is said to have invented the system of written characters, with which he superseded the method of keeping records by means of knotted cords.

**Fuh-chow,** or FOO-CHOW. City of s. China, near the Min, 34 m. from the coast; made a treaty port 1842; injured in the French war 1884. It has considerable commerce. Pop., 1893, with suburbs, 636,000.

**Fuji-san,** or FUSIYAMA. Volcanic mountain of Japan, 60



Fuji-san.

m. w. of Tokio; ascended by many pilgrims; height 12,365 ft.; last in eruption 1707–8.

**Fulcra.** Spinelike splints arranged in rows on the upper edge of the caudal fin of Ganoid fishes.

**Fulcrum.** Fixed point or rest about which a lever may turn.

**Fulda.** German abbey, founded 744. Its abbot was a prince and arch-chancellor of the Empire.

**Fulgentius,** FABIUS CLAUDIUS GORDIANUS, ST., 468–533. Bp. of Ruspe in Africa; banished by the Arians; writer on predestination. His day is Jan. 1.

**Fulgentius,** FABIUS PLANCIADES, 6th century. Latin writer on mythology and grammar.

**Fuliginous.** Organs or plants of a dull, dark-brown color.

**Fuller,** ANDREW, 1754–1815. English Baptist divine, ranking with Hall and Foster. *Calvinistic and Socinian Systems*, 1794; *Gospel Its Own Witness*, 1799.

**Fuller,** ANNA, b. 1856. American novelist. *A Literary Courtship*, 1892; *Peak and Prairie*, 1894.

**Fuller,** GEORGE, 1822–1884. Poetic and accomplished artist, the Hawthorne of American art. He lived for many years as a farmer in Mass., in default of recognition and patronage. His *Romany Girl* and *Quadroon* were exhibited at the World's Fair, Chicago, 1893.

**Fuller,** HENRY B., b. 1859. American novelist. *Chevalier of Perwieri Vani*, 1891; *Chatelaine of La Trinité*, 1892; *Cliff Dwellers*, 1894; *With the Procession*, 1895.

**Fuller,** MELVILLE WESTON, LL.D., b. 1833. Chief-justice U. S. Supreme Court since 1888.

**Fuller,** RICHARD, D.D., 1804–1876. Baptist pastor in Baltimore from 1847; noted for eloquence.

**Fuller,** SARAH MARGARET, MARCHIONESS D'OSSOLI, 1810–1850. m. 1847. American critic, ed. *Dial*, 1839–44. *Literature and Art*, 1846; *Woman in the 19th Century*, 1850.

**Fuller,** THOMAS, D.D., 1608–1661. English author, noted for quaint humor. *Holy and Profane State*, 1642; *Good Thoughts in Bad Times*, 1645–46; *Ch. History of Britain*, 1655; *Worthies of England*, 1662.

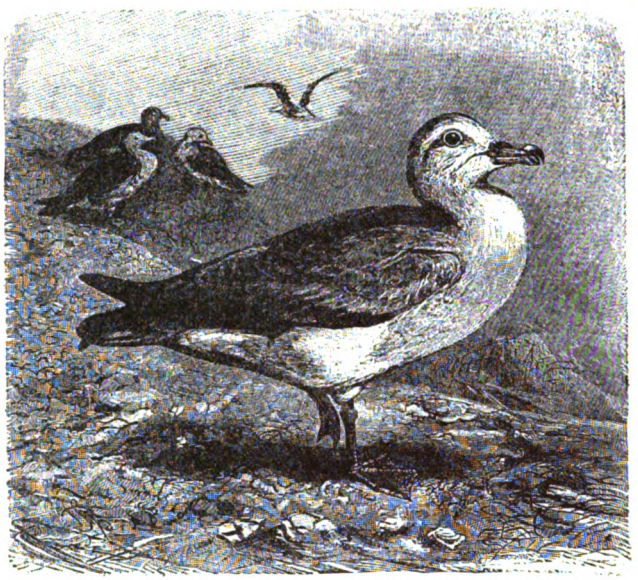
**Fuller's Earth.** Clay, usually grayish or greenish in color, which readily absorbs oil and grease. This property makes it useful in fulling woolen cloths.

**Fullerton,** LADY GEORGIANA CHARLOTTE (GOWER), 1812–1885; m. 1833. Anglo-Irish author and translator.

**Full Sap.** Method of driving the sap or trench when the approach is so near the enemy that the front and one flank are exposed to musketry fire. It consists of a parapet on the side from which flank fire comes, made of gabions, surmounted with fascines, and protected by sufficient earth to be musket-proof. The head of the sap during construction is protected by a sap-roller.

**Fulmar.** Largest of petrels, and very numerous; living in

Arctic Ocean and n. Atlantic as far s. as lat. 45° on the Ameri-



Fulmar (*Fulmarus* or *Procellaria glacialis*).

can side. It resembles a gull, has a habit of sailing in flight over waves, and lays one egg.

**Fulminates.** These are now regarded as metallic salts of a hypothetical fulminic acid, or fulminate of hydrogen, the formula for which is $H_2C_2N_2O_2$. The principal fulminate is that of mercury, discovered by Howard, and used in the composition for fuses, percussion caps, electric fuse, and detonators generally. It explodes violently when struck or compressed, or when touched with strong sulphuric acid or an incandescent wire or ignited body. The products of the reaction when it detonates appear to form instantaneously and make it a valuable agent for developing the entire power of dynamite, gun cotton, and other explosives.

**Fulminating Gold.** $Au_2O_3(NH_3)_4$. Ammoniacal auric oxide; green or brown powder, which explodes with great violence on percussion or when heated; made by precipitating gold chloride with ammonium hydroxide or carbonate.

**Fulminating Mercury.** $HgC_2N_2O_2$. Mercuric derivative of fulminic acid; made by dissolving mercury in nitric acid and adding alcohol; very explosive; used in making percussion caps.

**Fulminating Silver.** $Ag_2O.2NH_3$. Made by dissolving silver oxide in ammonium hydroxide and evaporating; black crystals, which explode on the slightest provocation.

**Fulminic Acid.** $C_2H_2N_2O_2$. Acid from which the fulminates are conceived to be derived. The salts of fulminic acids are among the most powerful explosives known.

**Fulton,** Robert, 1765–1815. American engineer; inventor of a steamboat which began to navigate the Hudson 1807. The success of this first experiment established his reputation, and it was rapidly followed by other vessels of the same description.

**Fulvia,** ab.80–40 B.C. Bold and ambitious woman, married successively to Clodius, Curio, and M. Antony, who divorced her to marry Cleopatra. Failing to induce Augustus to right her wrongs she retired into the East and died broken-hearted.

**Fumaric Acid.** $C_2H_2:(COOH)_2$. Dibasic solid acid occurring in fungi, Iceland moss, etc. It combines with great ease with bromine, forming dibromsuccinic acid, and is a stereo isomer of maleic acid.

**Fumarole.** Escape of steam from the ground in volcanic districts; also orifice from which it escapes.

**Fumigation.** Subjection of articles to the vapor or smoke of various substances, sulphur as a rule, for the purpose of disinfection; the process or agent employed.

**Fumitory.** Climbing or spreading herbs of the natural family *Papaveraceæ*, natives of Europe; introduced as weeds into America.

**Fumitory,** Climbing. *Adlumia fungosa*. Climbing herb of the natural family *Papaveraceæ*, with showy flowers, native of e. N. America.

**Funchal.** Capital and chief town of Madeira. Pop. ab.

Funchal—East View.

20,000. It has a good harbor and is the center of the wine trade of the island. A resort for consumptives.

**Funck,** Johann Nicholas, 1693–1777. German author of an extended history of the Latin language 1720–50.

**Function.** Active capacity of organic structures to perform certain actions adapted to the nature of such beings; *e.g.*, that of the stomach is to digest, of the heart to control circulation, and of the nerves to experience sensations.

**Function.** Quantity whose value is dependent upon that of another. In the calculus, functions are considered as dependent only upon variables; when the specific form is unknown or disregarded, the function of any quantity is indicated by F in some form placed before a parenthesis containing the quantity. Different functions unrelated are denoted by different forms of "f"; related functions are designated by the same form of "f," having superscript or subscript signs to make their difference. Functions are classified according to the particular discussions from which they arise, as trigonometric or logarithmic; according to the interrelations of their terms, as homogeneous and non-homogeneous; according to the limits of their development, as algebraic and transcendental. Functions of special form and of importance, receive special names, as Abelian functions, the Gamma Function.

**Functional Diseases.** Those in which there are no discoverable changes in the tissues, etc., before or after death.

**Functions of Government.** Duties which the government of a country or its subdivisions perform, as distinguished from those which are fulfilled by individuals or private combinations. Just what should and what should not be the functions of government has never been defined by any rule that has gained general acceptance.

**Fundamental Tone.** Gravest tone that can be produced by a vibrating body. In sounding its fundamental a body such as a stretched string is usually vibrating as a whole.

**Fundamental Units.** The three units of length, mass, and time, from which in every absolute system the other units are derived. In the C. G. S. these are the centimeter, gram, and second.

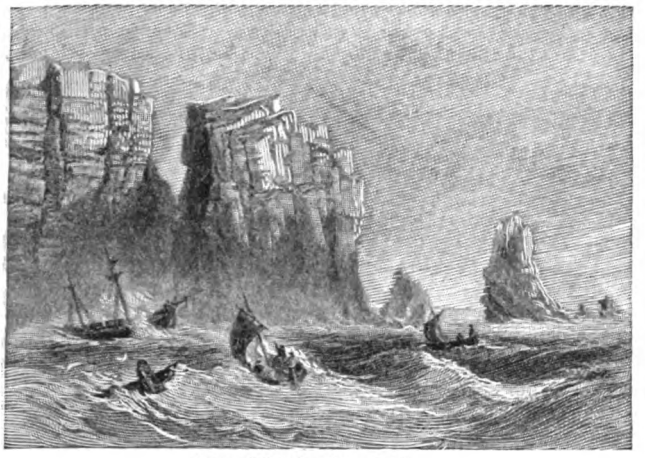
**Fundi.** *Paspalum exile*. Grain allied to the millets, much used as a food-stuff by the natives of w. Africa. Its wholesome and nutritive qualities render it favorable for the use of invalids, as it is light and easily digested.

**Fundi.** Ancient name for the town of Fondi, 13 miles n. of Gaeta. Owing to the proximity of a salt lagoon it is very unhealthy; has a Gothic cathedral and extensive remains of Cyclopean walls. Thomas Aquinas taught theology here. Its vicinity is very fertile, and was formerly noted for its wine. Pop. 7,324.

**Funding of a Debt.** When the various current debts of a government are all replaced by a general debt, not made payable at any particular time, but bearing interest during the time of its continuance; and the certificates of this indebtedness or money received for such certificates are given to the holders of the original evidences of debt, the debt is said to be funded. It is generally understood that the interest only, not the principal, of funded debts will be paid.

**Fundy,** Bay of. Between Nova Scotia and New Brunswick; length 140 m., greatest width 45. It is deep, but its navi-

gation is dangerous, on account of the rapid rise of the tides, which are the highest in the world, attaining in Shepody Bay



Bay of Fundy, Cape Split.

a height of fifty to seventy ft. It receives the St. John and St. Croix Rivers.

**Fünen,** or FUHNEN. Danish island, w. of Zealand. Area 1,135 sq. m.; pop. ab. 207,000.

**Funerals.** Impressive parade and solemnities typifying the soul's future journeying attended the interment of the ancient Egyptians. Elaborate ceremonial has always characterized Oriental funerals. Among the Greeks and Romans Funeral Games included processions, dramatic representations, horse-races and gladiatorial combats. Solon was the first to pronounce a funeral oration, 580 B.C.

**Funes,** GREGORIO, 1749–1830. Dean of Cordoba, Argentina. *Hist. del Paraguay, Buenos Ayres, y Tucuman*, 1816.

**Fünfkirchen.** Old town of Hungary, 139 m. s.w. of Pesth; held by Turks 1543–1686. Its cathedral dates from 1136. Pop., 1891, 33,780.

**Fungi.** The lowest extensive group of Crytogamous plants, the *Thallophytes*, is divided into two groups, the *Algæ* and *Fungi*. Of the latter more than 30,000 species are known. The *Fungi* are devoid of the ordinary green (chlorophyll) of plants, and obtain their nourishment from either living tissues (parasites), or those that were once alive (saprophytes). In structure *Fungi* consists of microscopic cells often long (hyphæ) and frequently woven more or less closely together.

The yeast plant (*Saccharomyces cerevisiæ*) is one of the simpler forms of saprophytic fungi, which thrives in the housekeeper's dough and by so doing causes the production of a gas that makes the bread light. The yeast plant consisting of a single cell may add to itself by a cell budding until there is a whole colony of yeast cells united together. In the higher forms of *Fungi* it is easy to distinguish between the vegetative portion (this with parasites is within the tissue bearing it) and the reproductive part that usually bears the spores on the free surface.

The spores are produced singly or in rows, upon the ends of hyphæ (conidia) or in sacs or coverings (ascospores). Some spores germinate quickly, and such are usually small, thin-walled, and produced in abundance superficially. Others pores are developed as a result of fertilization taking place between two or more filaments; a structure resulting therefrom often quite complicated, with the spores produced within.

Among the leading groups of *Fungi* is the *Peronosporeæ*, which includes such members as the grape mildew (*Plasmopara viticola*), the *Phytophthora infestans*, causing the serious soft rot of potatoes, and *Cystopus caudidus*, familiar to many as a white mould upon radish and other mustard-like plants. The order *Saprolegnaceæ* feeds upon the dead bodies of animals, in water in particular. The *Mucorini* include the true Moulds, *Rhizopus nigricans* being the name of the common bread mould. A much more conspicuous and destructive group is the *Ustilagineæ*, which embraces hundreds of species of Smuts. The spores are exceedingly abundant, and are usually formed in the grain. The smut of oats, wheat and corn are good examples. The Rusts belong to another family (*Uredineæ*), and include *Fungi* that are strictly parasitic, and assume two or more distinct forms in their life history. Thus the large orange galls upon the cedar trees are linked with a rust upon the apple, as in like manner the rust of wheat has a cluster cup like that upon the barberry. The *Fungi* with spores in sacs are grouped under the term *Ascomycetes*. This includes such poisonous species as the Ergots extensively used in medicine. Many of the Mildews are found here, and such striking *Fungi* as the black knot of plum and cherry trees. Among *Hymemomycetes* are the shelf *Fungi* on trunks of trees, and very many other of the larger species, as toadstools and the MUSHROOM (q.v.). Puffballs are placed under the *Gasteromycetes*.

Many of the coarse *Fungi* are edible. The larger number require the microscope for seeing them. See MYCOLOGY.

**Fungicide.** Substance which destroys fungi; *e.g.*, cupric sulphate.

**Fungidæ** (MUSHROOM CORALS). Large, flat, single calices, whose conspicuous and toothed septa are united by synapticulæ. See MADREPORARIA.

**Fungo.** Game played with bat and ball, commonly known as Knock up and Catch, and played by any number of players. One knocks the ball into the air, The one catching it takes the place of the batsman.

**Fungology.** Study of Fungi; mycology.

**Fungus Foot.** Disease of India in which the foot swells, is covered with vesicles and is full of sinuses discharging pus. Is held by some to be a form of actinomycosis and by others to be due to a specific fungus.

**Funicular Polygon.** Formed by a cord suspended at its ends when weights are attached at different points; often called the equilibrium polygon because the stresses in the cord hold the weights in equilibrium.

**Funiculus.** 1. Hollow cord uniting different segments of the nucleus of Protozoans, as in *Stentor* and other Ciliates. 2. Cord attaching the alimentary tract in *Polyzoa* to the body wall; along it the statoblasts are fixed.

**Funiculus.** Stalk which supports the ovule in the ovary of a flower; known also as the Podosperm.

**Funnel.** Stomach or common cavity in a ctenophoran Jelly-fish, into which the œsophagus, apical canals, paragastric canals, and radial canals open.

**Fürbringer,** MAX, Ph.D., b. 1846. Prof. of Anatomy at Amsterdam 1879, Jena 1888. *Morphologie und Systematik der Vogel*, 1888.

**Furcula.** "Merry thought," or wish-bone; *i.e.*, united clavicles of birds.

**Furetiere,** ANTOINE, 1620–1688. French poet, satirist, and lexicographer; Academician 1662–85. *Le Roman Bourgeois*, 1666: *Dictionnaire*, 1690.

**Furfuraceous.** Surfaces of leaves or other organs covered with scurf.

**Furfurane.** $C_4H_4O$. Bpt. 32° C. Liquid with an odor like that of chloroform, present in pine-wood tar.

**Furfurol.** $C_4H_3O.CHO$. Bpt. 162° C. Aldehyde of furfurane; liquid of agreeable odor, produced by the action of sulphuric acid upon carbohydrates; present in fusel oil and in the products of the dry distillation of wood. It yields pyromucic acid upon oxidation.

**Furies.** See EUMENIDES.

**Furius,** AULUS, ab. 100 B.C. Latin poet, of whose works a few fragments remain.

**Furius,** MARCUS, ab. 103–24 B.C. Latin epic and lyric poet, satirized by Horace.

**Furlanetto,** GIUSEPPE, 1775–1848. Prof. Padua; enlarger and editor of Forcellini's Latin lexicon, 1816–31.

**Furling a Sail.** Wrapping it close to the yard and fastening it with a cord.

**Furlong.** Ancient stadium; eighth of a mile.

**Furlough.** Leave of absence granted to officers or soldiers.

**Furnace.** Structure built at or near the bottom of the upcast shaft in a mine in which a fire is maintained to promote the ventilation of the mine workings.

**Furnaces.** Constructions of fire brick or similar heat-resisting material, intended for heating purposes. They may be classed into those in which:

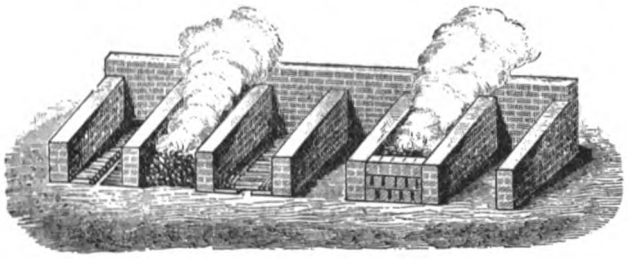
I. The fire and the material to be heated are placed in contact in one chamber.

II. The fuel is in one compartment and the material to be heated in another, the material being heated by contact with the flame or hot gases.

III. The material to be heated is within a close chamber or retort, which is heated externally by the fire or gases from the fire.

Class I. are sub-divided into furnaces with *a*, temporary walls, *b*, permanent walls. Examples of *a* are charcoal-piles

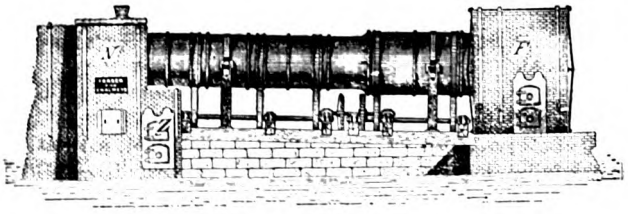
and ore-heaps, whose walls are fine charcoal, earth, or fine ore, and are pulled down and built up for each operation. Stalls for roasting ores are often built with permanent walls on three sides, while the front is temporary. Furnaces of division *b* are classified into those worked with natural draught and those worked with blast. They are generally in the form of a shaft or chimney, which may be cylindrical, conical, or pyramidal. Lime-kilns, kilns for roasting ores, and small furnaces for reducing lead and tin ores, are worked with the natural draught.



Stalls for Roasting Ores.

Where blast is used, we have the various kinds of blast-furnaces for smelting iron, copper and lead ores, and the familiar cupola of the iron foundry. When built of two concentric iron shells, between which water circulates freely, such a furnace is said to be water jacketed. It is a frequent practice to water jacket parts of furnaces exposed to intense heat or rapid corrosion.

Class II. is best illustrated by the reverberatory furnace, used in puddling iron and for roasting and melting ores and metals. The roof is arched over from the fire-place to the hearth, and the flame is thus reflected or reverberated downward on to the hearth. In a puddling furnace, when used for roasting ores, the bed is greatly extended, sometimes to 60 feet. The bed is



Rotary Calciner.

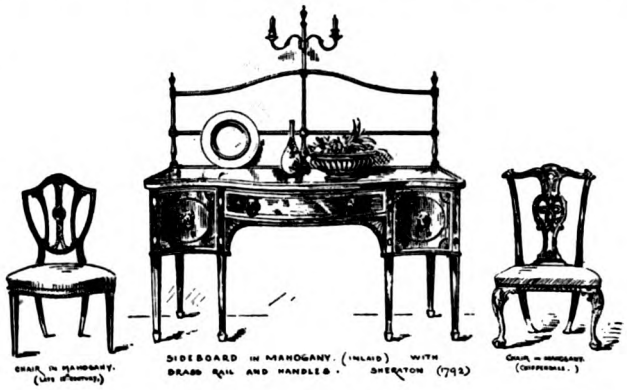
sometimes replaced by a revolving cylinder, inclined toward the fire-place, through which the flame passes while the material fed in at the upper end is automatically discharged. Such are called rotary roasters or calciners. In the German furnaces for cupelling silver the whole roof of the hearth is made removable to facilitate repairs.

Class III. includes a great variety of constructions, generally called retort furnaces. The best known are ordinary crucible furnaces or melting holes, and the Belgian and Silesian zinc furnaces.

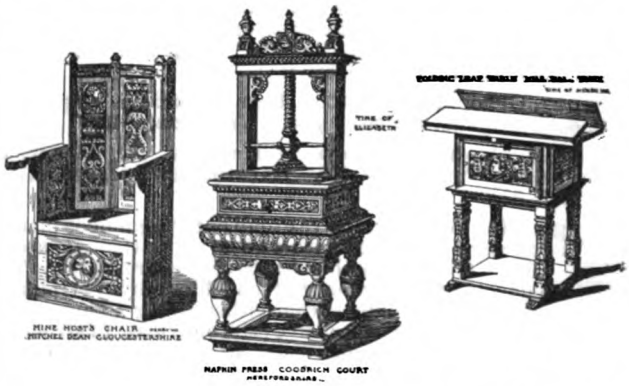
When using gas as fuel, the regenerative system is used. The hot gases leaving the furnace pass through chambers filled with brickwork, called regenerators, in which they give up their heat, which is returned to the furnace by being used to heat up the gas and air. Such a furnace is the Siemens, in which large quantities of steel can be melted to complete fluidity.

**Furness,** WILLIAM HENRY, D.D., LL.D., 1802–1896. Unitarian pastor in Phila. 1825–75. He pub. much on the life of Christ, and tr. German poems.—His son, HORACE HOWARD, Ph.D., LL.D., b. 1833, is of high rank as an editor of Shakespeare. His Variorum ed., begun 1871, has included 10 plays.—His brother, WILLIAM HENRY, 1828–1867, was a portrait painter.

**Furniture.** From sculptures, wall-paintings, and articles found in the tombs we learn that the Egyptians brought the art of cabinet-making to great perfection; the Assyrians and Greeks also produced furniture in wood, ivory, and precious metals, elaborately carved. Before the Crusades domestic furniture scarcely existed in w. Europe, and was meager till ab. 1500 even in baronial castles. The Renaissance artists in making furniture used wood decorated with gilding and paintings, inlaid with agate, carnelian, lapis lazuli, variously-tinted marble, ivory, tortoise-shell, and mother-of-pearl. It was also richly decorated with sculpture. Italy was foremost, but French schools soon became prominent. Early in the 17th century marquetry became a leading feature in decorative furniture, and the architectural idea finally died out. Then came BOULE (q.v.) under Louis XIV., and, though Tudor oak lingered in England, French furniture was imported. Renaissance moldings and broken shell-shaped woodwork known as Louis Quinze work next became popular, and the fantastic curves called Rococo showed to the best advantage the luster of heavy gilding then so prevalent. Famous designers of artistic furniture were J. A. Meissonnier and Vernis Martin. Later in the 18th cent-




ury arose Riesener and David, noted marquetry-makers, and Gouthière, a founder and chaser of metal furniture-mounts. In England there was an imitative school of carvers, gilders, and ornamenters, in the extravagant French style headed by Thomas Chippendale. Under Louis XVI. the discoveries at Herculaneum resulted in a stronger taste for classical style.




Ebony, tulip, maple, laburnum, and purple wood were most fashionable. In England, ebony, satin wood, and mahogany successively came into favor, and Adam, Heppelwhite, and Sheraton were the most famous cabinet-makers. Since the decay of the Classical revival Oriental influence has chiefly affected modern furniture and machinery has supplanted trained artists.

**Furnivall,** FREDERICK JAMES, b. 1825. English Shakespearean scholar; founder of the Early English Text Society and Chaucer Society, and editor of many Early English texts.

**Furs.** Skins covered with hairs, soft, thick, short, and fine, used for warm garments. Those most highly prized are the silver fox, ermine, sable, seal, beaver, otter, chinchilla, and lynx. The cat and rabbit are now largely used in making good imitations of the more expensive furs.

**Furruckabad,** or FARRAKHABAD. Commercial city of British India, on the Ganges. Here Lord Lake defeated Holkar 1805. Pop., 65,000.

**Fursch-Madi,** MME. AMY, ab. 1840–1894. French opera singer, settled in the U. S. 1883.

**Fur Seals.** *Callorhinus ursinus.* The Northern Sea Bear is the main source of seal-skins. Its color is nearly black; the female is lighter and the young darker than the male, which is six times larger than the female; it weighs 500 lbs., and is 7 ft. long at 8 years of age. Formerly abundant to s. California, it is now nearly restricted to the Prybilov Islands, Alaska, along a coast of only 19 m. extent. Early in May the bulls begin to select stations for their seraglios. By the end of May the cows have nearly all arrived and been appropriated, through fierce contests, between the males. The cows are each soon delivered of one pup. By August the bulls begin leaving, and by October the Rookeries are broken up, though some linger till

Christmas. The young breed at 3 years. The Alaska Commercial Co. has limited the number taken at Prybilov Islands,

Fur Seals.

but cannot prevent their destruction when traveling away from or to their breeding grounds.

**Furst,** JULIUS, 1805–1873. Polish Jew, teacher at Leipzig from 1839; author of a Latin Concordance to O. T., 1837–40, and a Hebrew and Chaldee Lexicon, 1857–61, tr. 1865.

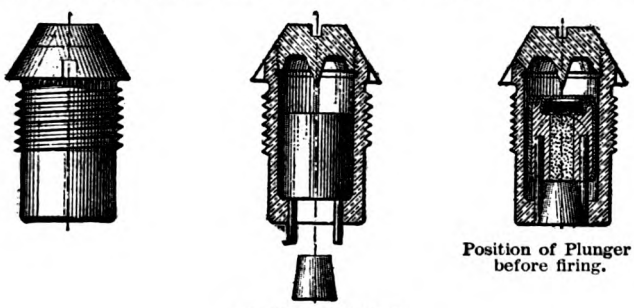
**Furuncle.** See BOIL.

**Furze.** *Ulex europæus.* Very spiny, yellow-flowered shrub of the natural family *Leguminosæ*, native of Europe, introduced in America; known also as Gorse and Whin.

**Fusan.** Port of Corea, opened 1876; Japanese settlement since 1592. Pop., 1891, 5,329.

**Fusang.** Country ab. 7,200 m. e. of China, from which came to China in 499 as envoy a Buddhist monk named Hwei-shin. Some have identified it with Mexico, others with Japan. The claim that America was known in Asia in the 5th century lacks proof.

**Fuse,** or FUZE. Woven cord, containing powder, used in blasting to convey the fire to the charge of explosive.—Contrivance to ignite the bursting charge of a hollow projectile. It is screwed into the point or base of a projectile, and is set off either by percussion, time, or a combination of both. The




Hotchkiss Point Percussion Fuse.

principal fuses used in the U. S. Service are, the Frankford Arsenal Base-Percussion Fuse "A," model 1893; "B" and "C," model 1894; the Point-Percussion fuse for Hotchkiss Mountain Rifle; the Point-Combination fuse 15 seconds, and the Combination fuse 28 seconds, for high-angle and low-velocity fire.

**Fuseli,** HENRY, 1741–1825. Swiss-English historical painter, R. A. 1790. *Lectures on Painters*, 1820.

**Fusel Oil.** Mixture of alcohols formed as by-products in the ordinary alcoholic fermentation; obtained as a residue in the distillation of ordinary alcohol. It is a variable mixture of propyl, amyl, and butyl alcohols, with some ethers and fatty acids. It is this which gives the bad taste and qualities to cheap whiskies.

**Fusible Alloys.** Newton's Metal 8 Bi, 5 Pb, 3 Sn melts at 212° F. Rose's Metal 2 Bi, 1 Pb, 1 Sn melts at 201° F. Most fusible 50 Bi, 25 Pb, 12 Sn, 13 Cd melts at 155° F. Bi, bismuth; Pb, lead; Sn, tin; Cd, cadmium.

**Fusible Plugs.** Stopper of some metal which melts at a low point, inserted into the fire-box sheet of a boiler. Its normal condition is to be kept by the water on the inside of it at a temperature below fusion. Should the water by accident get so low in the boiler as to leave the plug uncovered, it melts by the heat of the fire, and is blown out, the escaping steam acting to quench the fire and prevent the injury to the shell which overheating would cause. A newer plan is to put a disk of fusible metal so that when it is melted by a higher temperature than that at which the water normally keeps it, the escaping steam shall blow an alarm whistle. This plan avoids cooling the boiler and fire to replace the plug. See FUSIBLE ALLOYS.

**Fusiform.** Spindle-shaped roots of the long radish, and similarly shaped vegetable structures generally.

**Fusil.** Heraldic bearing, rhomboidal in shape, and longer than the lozenge. Covered with fusils, the shield is said to be fusilly.

**Fusiliers.** Soldiers carrying light muskets; now merely a name of honor borne by certain British regiments.

**Fusion.** Change of state from solid to liquid, usually produced by the application of heat. The temperature at which it occurs is the Melting Point, and is a characteristic of the substance. In most instances the process is reversible at the same temperature, but in some cases crystalline bodies will remain liquid after the temperature has been reduced far below the melting point. This phenomenon is called Surfusion. Solidification may be produced at once by dropping a small fragment of the solid substance into the liquid mass. Fusion produced by heat alone may be called Igneous; if by solution in some liquid it is Aqueous. Some substances pass from the solid to the liquid state without showing any definite melting point; *e.g.*, glass and iron pass through an intermediate pasty condition, the state of Vitreous fusion.

**Fusiyama.** See FUJI-SAN.

**Fust,** JOHANN. Partner of Gutenberg, inventor of printing, 1450–55, and of Schoeffer till 1462.

**Fustel de Coulanges,** NUMA DENIS, 1830–1889. Prof. Paris 1875. His *La Cité Antique*, 1864, and *Hist. Institutions politiques de l'ancienne France*, 1875, were crowned by the Academy.

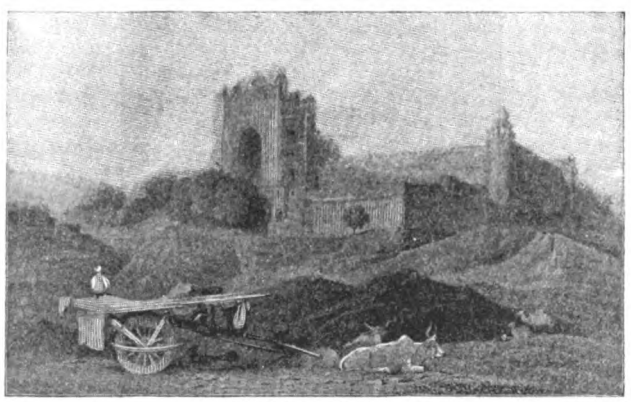
**Fustian.** Cotton cloth with a heavy pile like velvet and made in the same way.

**Fustic.** Yellow wood of *Toxylon pomiferum*, a tree of the natural family *Moraceæ*, native of s. N. America, and of *Rhus cotinus*, a large shrub of the *Anacardiaceæ*, native of s. Europe. Both are employed in dyeing.

**Fustin.** See MACLURIN.

**Fusus.** See RHACHIGLOSSA.

**Futtypore Sigri.** Town ab. 20 m. s.w. of Agra, India, containing the favorite palace of Akbar and other Mogul Em-



Futtypore Sigri.

perors. Its gateway is of extreme beauty. Consists chiefly of a vast expanse of ruins inclosed by a high stone wall. Pop., 1891, 6,300.

**Future Estate.** Interest in property of which one is to acquire possession in the future.

**Futures.** Agreements made between sellers and buyers to deliver certain goods at a given price, at a certain time in the future. Frequently the goods are not delivered at all, when the appointed date arrives, but the difference between the price agreed upon and the ruling market-price paid over by the seller or the buyer, as the current price may be greater or less than that named in the contract.

**Future State.** Condition of human beings after death; according to Ch. of Rome, either in heaven, hell, or purgatory; with Protestants, in an intermediate state, awaiting final judgment, or in a state of felicity or of punishment. The subject has an extensive literature of its own, and has developed wide differences of opinion.

**Fux,** JOHANN JOSEPH, 1660–1741. Austrian organist and musical composer. The theoretical work, *Gradus ad Parnassum*, 1725, is his masterpiece.

**Fuze.** See FUSE.

**Fyffe,** CHARLES ALAN, 1845–1892. English historian. *Hist. Modern Europe*, 1880–86.

**Fyrouz I.** King of Persia A.D. 83–103.—II., 459–483.—III., driven from Persia by the Arabs 641.

**Fyt,** JAN, 1611–1661. Flemish painter of still-life and animals. Two fine examples, retouched, are in N.Y. Metropolitan Museum.

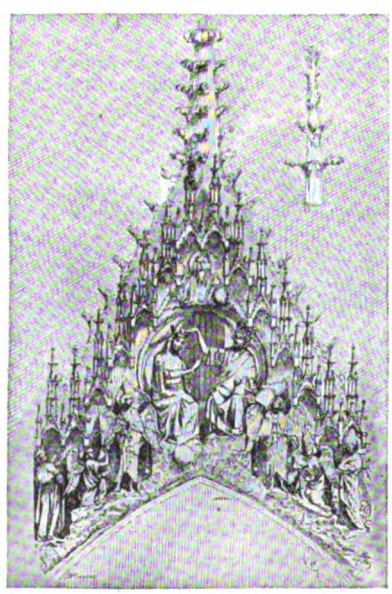
# G

**Gabardine.** Rough Irish mantle, or long cloak. In Elizabethan times it formed, together with a tall yellow cap, the distinctive dress of the Jews.

**Gabion.** Cylindrical open basket, ab. 2¾ ft. high and 2 ft. wide, formed by a wattling of withes or of hoop-iron, sufficiently close to hold earth. The wattling stakes are sharpened to plant the gabion at the proper inclination. It is used by sappers in constructing the parallels and approaches during siege operations, and for revetting the steep slopes of traverses, gun embrasures and earthworks.

**Gabionade.** Traverse placed between guns in a siege battery, or forming its flank protection. It is constructed by placing gabions side by side in a row, so as to inclose a rectangular space ab. 15 feet wide, perpendicular to the parapet. This row is surmounted by two others, and the interim space is filled with earth closely packed and tramped.

**Gable.** Triangular wall facing and masking the roof of a building. Its first appearance is believed to have been in Greece, the pediment being a new feature added to the walls and colonnades of the Egyptian builders. Wherever a peaked roof is used the gable is employed unless the roof is hipped or



Gable from Rheims Cathedral.

slanted inward at the ends. The Grecian roof is of low pitch, as is also that of the Romanesque styles, and the gable of course conforms to its angle. In Gothic architecture the gable became steeper, and an important feature, being often richly decorated with rose windows or groups of lancets, in the face, and furnished with a molded coping or with crow steps. In the Renaissance of northern Europe, especially in Holland, the gable often assumes fantastic forms and extends considerably beyond the roof which it masks, as is also the case in Spanish work of the same period. In wooden buildings the roof is often projected beyond the gable and ornamented by carved work in timber, forming BARGE-BOARDS or VERGE-BOARDS (q.v.).

**Gabled Tower.** One of which each face terminates in a gable. Sometimes a spire surmounts a gable tower, but oftener the roofs of the gables complete the structure.

**Gablenz,** LUDWIG KARL WILHELM, BARON VON, 1814–1874. Austrian general, prominent in Italy, at Solferino, and at Sadowa.

**Gablet.** Small gable, used chiefly at the offset of a buttress or as a terminal feature.

**Gable Window.** Opening in a gable, sometimes applied to a rose-window below the gable.

**Gaboon.** River or estuary of w. Africa, near the equator, ab. 50 m. long.—Also a French colony thereabout, lat. 2° N. to 5° S.; area ab. 250,000 sq. m.; founded 1842. The region was explored by Brazza 1876–86.

**Gaboriau,** ÉMILE, 1834–1873. French novelist of the detective school. *Affaire Lerouge*, 1866; *File No. 113*, 1867; *M. Lecoq*, 1869; *Slaves of Paris*, 1869.

**Gabriel.** Angel sent to Daniel, Zacharias, and the Virgin Mary. Luke i.

**Gabriel,** ORDER OF ST. Founded (1) in Italy 1638, (2) in France 1835; both for teaching.

**Gabrieli,** ANDREA, 1510–1586. Venetian organist, composer of psalms, madrigals, organ pieces, and the like, as was also his nephew and pupil, GIOVANNI, 1557–1613.

**Gachard,** LOUIS PROSPER, 1800–1885. Belgian historical writer.

**Gad.** Small, pointed iron tool used by miners in working jointed or fissured rock.

**Gad.** Seventh son of the patriarch Jacob; ancestor of one of the twelve tribes, settled e. of Jordan.—Also, a prophet and chronicler of David's time.

**Gadames.** Berber oasis and town at the edge of the Sahara on s.w. frontier of Tripoli. Important caravan trade emporium. Pop. ab. 7,000.

**Gadara.** Ancient Syrian town, now in ruins; 8 m. s.e. of Sea of Galilee.

**Gaddi,** GADDO, TADDEO, and AGNOLO, 14th century. Italian painters, followers of Giotto's style and methods.

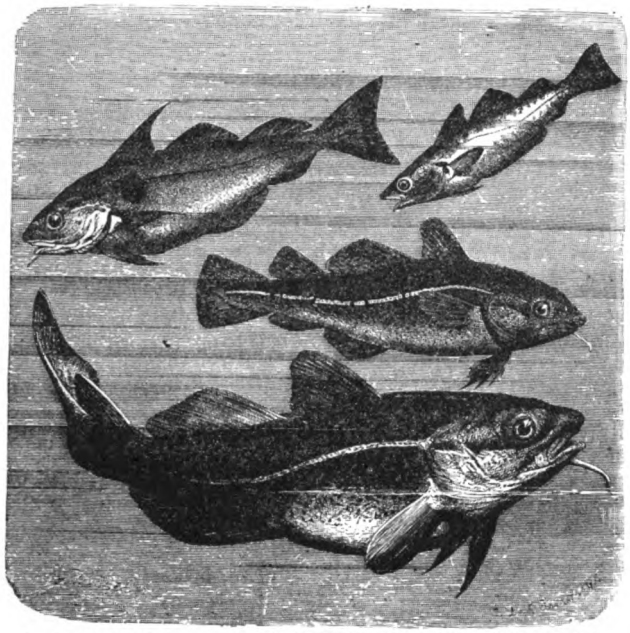
**Gade,** NIELS WILHELM, 1817–1890. Most eminent of Danish musicians; founder of the Danish School of Composition, which received its first impetus from his overture, *Nachklänge aus Ossian*, 1841. He composed 8 symphonies, 5 overtures, 2 violin concertos, and 8 cantatas, besides chamber and ch. music.

**Gades.** City of Spain on the Atlantic coast, founded by the Phœnicians; commercially important; now Cadiz.

**Gadfly.** See ŒSTRIDÆ and TANYSTOMATA.

**Gadidæ** (CODFISHES). Of the suborder *Anacanthini;* besides the Cod, HADDOCK (q.v.), Whiting, Burbot, etc., are included. The Cod (*Gadus morrhua*) has the lower jaw shutting within the upper, and a large barbel on the chin, and weighs sometimes over 100 lbs., but it averages ab. 10 lbs. at Cape Cod. It is a cold water fish, not going south of Hatteras. Mollusks form a part of its diet. The eggs are spawned in autumn in the ocean and float. The largest fish produce ab. ten million

eggs. The Whiting is a European food fish. The Burbot (*Lota*) is a fresh water Cod. The spawning season is late in winter;



1. Haddock (*Gadus æglefinus*); 2, Whiting (*G. merlangus*); 3, 4, Cod (*G. morrhua*).

the eggs are deposited on the bottom and hatch in ab. 3 wks. The roe and liver are the parts most esteemed for food.

**Gadolinite.** Yttrium, beryllium, and iron silicate, found in Sweden.

**Gadow,** Hans Friedrich, Ph.D., F.R.S., b. 1855 at Cracow. Lecturer at Cambridge; writer on ornithology.

**Gads,** or Gadlyngs. In Mediæval armor the bosses or spikes with which the knuckles were armed.

**Gadsby,** Henry Robert, b. 1842. English composer of ch. music.

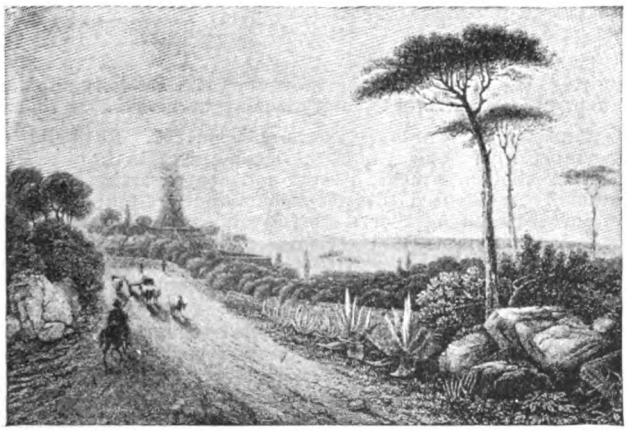
**Gadsden,** Christopher, 1724 1805. Patriot of S. C., prominent in the Revolutionary war.—His grandson, James, 1788–1858 was U. S. Minister to Mexico 1853, and negotiated the "Gadsden Purchase" from that country of 45,535 sq. m. s. of the Gila, now forming part of Arizona and New Mexico, for $10,000,000.

**Gæa,** or Ge. Greek personification of the earth, firstborn of Chaos. She had altars and temples in most of the Greek cities, and her surnames refer to her as the all-producing and all-nourishing mother.

**Gaelic,** or Erse. Small branch of the once widespread Celtic family, still existing in Ireland, the Scotch Highlands, and the Isle of Man. From it McPherson professed to have tr. his poems of Ossian.

**Gaertner,** Joseph, 1732–1791. Physician and botanist of Stuttgart. *De fructibus et seminibus plantarum*, 1788–1807.

**Gaeta.** Italian seacoast town, 40 m. n.w. of Naples; favor-



Bay of Gaeta.

ite resort of ancient Romans; often besieged; taken by the French 1799, and July 18, 1806; by the Austrians 1815 and 1821. Pius IX. took refuge here 1848–49, and Francis II. of Naples 1860–61, when it fell after 3 months' siege. Pop., 1891, 16,848.

**Gætulia.** Ancient country of n.w. Africa, s. of Mauritania and Numidia. Its people, probably ancestors of the Berbers, supported Jugurtha against Rome, and were conquered by Lentulus ab. 5.

**Gaff.** 1. Spar to which the head of a sail is attached. 2. Hook for landing salmon and other game fish.

**Gage,** Matilda Joslyn, b. 1826 in N. Y. Champion of woman suffrage.

**Gage,** Simon Henry, b. 1851. Prof. of Physiology at Cornell 1889. *The Microscope and Histology*, 1881.

**Gage,** Thomas, 1597–1655. R. C. missionary in Mexico 1625–37; Anglican rector 1644. His book on the New World, 1648, though untrustworthy, caused much sensation.

**Gage,** Thomas, 1721–1787. Commander-in-chief of the British forces in America 1763; Gov. of Mass. 1774–75; responsible for the affairs at Concord, Lexington and Bunker's Hill, and recalled soon after.

**Gage of a Ship.** Depth of water she draws.

**Gageen,** Heinrich Wilhelm August, Freiherr von, 1799–1880. Statesman of Hesse-Darmstadt; Pres. Frankfort Parliament 1848; advocate of German unity.

**Gagliano,** Marco Zanobi da, 1602–1642. Florentine musician, one of the earliest composers of operas. His *Dafne*, composed for a court wedding in Mantua 1607, was printed 1608. Other works are *La Regina Sant' Orsolo*, 1624; masses, madrigals, etc.

**Gahn,** Joseph Gottlieb, 1745–1818. Swedish chemist.

**Gahnite.** $ZnAl_2O_4$. Mineral allied to spinel, but containing zinc in place of the magnesium of ordinary spinel.

**Gaia.** Goddess of earth, marriage, and death; first born of Chaos; mother of Uranus, Pontus, the Titans, Cyclops, and many more; worshiped generally in ancient Greece.

**Gail,** Jean Baptiste, 1755–1829. Greek prof. Coll. of France 1792; ed. Homer, Thucydides, Xenophon, and other classics.—His son, Jean François, 1795–1845, did similar work.

**Gaillard,** Claude Ferdinand, 1834–1887. French painter and engraver.

**Gaillard,** Edwin Samuel, M.D., LL.D., 1827–1885. Prof. Louisville Med. Coll. 1868; founder *Rich. Medical Journal*, 1866.

**Gaillard,** Gabriel Henri, 1726–1806. French historian and Academician. *Mary of Burgundy*, 1757; *Francis I.*, 1766; *Rivalry of France and England*, 1771–77; *Charlemagne*, 1782.

**Gaillardet,** Théodore Frederic, 1808–1882. French dramatist, founder, while in N.Y., of the *Courrier des États-Unis*. *Struensée*, 1832; *Georges*, 1833.

**Gaimar,** Geffroy, ab. 1150. Author of a Metrical Chronicle, *Estorie des Engles*.

**Gaines,** Edmund Pendleton, U. S. A., 1777–1849. General, noted for his defense of Fort Erie 1814.—His wife, Myra Clark, 1805–1885, was the claimant in a famous and finally successful suit, lasting many years and involving an immense property in New Orleans.

**Gaines' Mill,** or Cold Harbor, or Chickahominy, Battles of. In Va., June 27 and 28, 1862. Federal loss near 7,000.

**Gainsborough,** Thomas, 1727–1788. English portrait and

The Brook, by Thomas Gainsborough.

landscape painter, ranking next to Sir Joshua Reynolds. Fourteen examples of his work are in the National Gallery, London.

**Gairdner,** JAMES, b. 1828. English historian; editor of many documents from the Record office. *Richard III.*, 1878; *England*, 1879; *Henry VII.*, 1889.—His brother, WILLIAM TENNANT, M.D., LL.D., b. 1824, prof. Glasgow since 1862, has written much on medical topics.—Their father, JOHN, 1790–1876, and uncle, WILLIAM, 1793–1867, were eminent physicians.

**Gaisford,** THOMAS, D.D., 1779–1855. Prof. Oxford 1811· ed. Herodotus and other Greek texts.

**Gaits.** Natural or acquired movements of progression in animals; viz., the walk, jump, amble, rack, singlefoot, pace, trot, canter, gallop, and run. Quadrupeds when walking have always at least two feet on the ground, in all other gaits all four may be off momentarily. In ambling and pacing the side legs act together; in trotting, diagonal legs move simultaneously; in cantering, galloping and running, the fore and hind legs pair. The rack and pace are modifications of the amble. The relative speeds are walk, amble, trot, pace, canter, gallop, run.

**Gaius,** 2d century. Latin writer on law. His *Institutes*, recovered in a palimpsest 1816, were pub. 1820 and tr. 1890. They had been freely used by Justinian and the Visigoths.

**Galactometer.** Hydrometer for testing the purity of milk, by determining the specific gravity. Cream is measured in a graduated tube, in which the milk is allowed to stand.

**Galactose.** $C_6H_{12}O_6$. Crystalline kernels; mpt. 142–144° C. Produced, with dextrose, by heating milk sugar with dilute sulphuric acid; also from agar-agar by the same process. It ferments with yeast.

**Galago.** See LEMURIDÆ.

**Galahad,** SIR. Purest of Arthur's knights; finder of the Holy Grail; celebrated by Sir T. Malory and Tennyson.

**Galapagos Islands.** Volcanic group in the e. Pacific, on the Equator; described 1684, explored 1836; held by Ecuador, which has attempted to colonize them. Area ab. 2,950 sq. m., soil poor, pop. scanty.

**Galashiels.** Town of Scotland, near Melrose; noted for its manufacture of Scotch tweed.

**Galatea.** Heroine of Greek mythology, celebrated by many poets. Her lover, Acis, was killed by his rival, Polyphemus.

Triumph of Galatea, by Domenichino.

The subject of the Triumph of Galatea was very popular with the old masters. The most famous pictures are by Raphael, Domenichino, Albani, N. Poussin, A. Caracci, Giordano and Botticelli.

**Galatia.** Central province of Asia Minor, occupied 276 B.C. by a barbarous tribe of Gauls. It became a Roman province under Augustus.

**Galatians,** EPISTLE TO. 9th N.T. book, written by St. Paul ab. 57 to the churches of Galatia to rebuke their inconsistency.

**Galatz,** or GALUCZ. Town of Roumania, Moldavia, on the Danube; seat of the Danube Commission since 1856; scene of numerous battles between Turks and Russians since 1789. Pop., 1890, 59,143.

**Galaxy,** or MILKY WAY. Irregular, luminous belt surrounding the heavens, having the general direction of a great circle. For ab. one-third of its extent it is divided into two nearly parallel streams. When examined with a telescope it is found to consist of immense numbers of small stars.

**Galba,** SERVIUS SULPICIUS, 3 B.C.–A.D. 69. 6th Roman Emperor; Consul 33; Gov. of Gaul 39, Africa 45, and Spain 61. He succeeded Nero, reigned seven months, and was murdered.

**Galbanum.** Gum-resin, derived from several plants of the Carrot family.

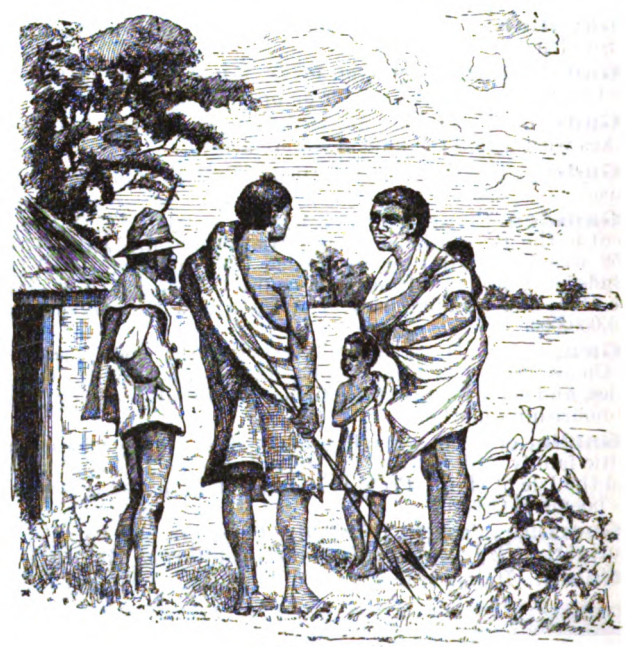
**Galbulus.** Cone of certain trees of the Cypress tribe, consisting of woody or fleshy scales with a narrowed stalk-like base, forming a globular structure.

**Galdós,** BENITO PÉREZ, b. 1845 in the Canary Islands. Spanish novelist, dealing at first with the Napoleonic wars, and later with contemporary manners; ed. *Revista de Espana*. *Fountain of Gold*, 1871; *Trafalgar*, 1873; *Battle of Salamanca*, tr. 1895; *Dona Perfecta*, 1880, tr. 1895.

**Galea.** *Lobus externus* of the first maxilla of Insects; between the lacinia and the maxillary palp.

**Galeate.** Corolla of flowers when shaped like a helmet, as in Aconite.

**Galekas.** Branch of the Kafir race in s. Africa inhabiting the country between the Kei and Bashee Rivers. Till recently



Galekas.

they were the masters and oppressors of the Fingoes, another branch, and have strong tribal sentiment, numbering ab. 70,000.

**Galen,** or CLAUDIUS GALENUS, 130–ab. 200. Physician of Pergamus, n.w. Asia Minor, at least thrice in Rome. His authority abolished medical sects and controversies, and was practically undisputed till the Renaissance. Of his works 83 remain, besides a number doubtfully or wrongly ascribed to him. Among these are *Ars Medica*, *De Anatomicis Administrationibus*, and *De Usu Partium Corporis Humani*. He also wrote on logic, and is credited with introducing the fourth figure of the syllogism.

**Galena.** Town of Illinois, it takes its name from the important lead-sulphide mines in the neighborhood, which have been worked since 1810. Pop., 1890, 5,600.

**Galena,** or GALENITE. PbS. Mineral containing, when pure, 86.6 per cent of lead and 13.4 of sulphur, though often carrying silver enough to be classed as a silver ore. It occurs under a great variety of conditions, but is easily recognized by its brilliant metallic luster and cubical cleavage.

**Galeodea.** See SOLIFUGÆ.

**Galeopithecidæ** (DERMOTEA, DERMOPTERA, FLYING LEMURS). Family of *Insectivora* forming a connecting link with the Lemurs. Only two species are known, both inhabiting the Malay region. They possess a patagium or fold of skin along each side of the body from the neck to the tail, and including the limbs. The toes of the foot are also webbed. Neither hallux nor pollex are opposable. They live principally upon fruit, leaves and insects. The stomach is large and has a large cæcum. They are chiefly nocturnal, and have no powers of true flight, but, like the Flying Squirrels, can make extended sailing leaps. The lower incisors are comb-like at the crowns.

**Galerite.** Helmet-shaped sea urchin of the Chalk period.

**Galerius** (G. VALERIUS MAXIMIANUS), d. 311. Cæsar 292; son-in-law of Diocletian; Emperor of the East from 305. He invaded Persia, instigated the terrible Tenth persecution, and was a capable soldier but a cruel tyrant.

**Galesburg.** City of Knox co., Ill., 163 m. s.w. of Chicago; seat of Lombard Univ. and Knox Coll. Pop., 1890, 15,264.

**Galgacus.** Caledonian chief who stubbornly opposed Agricola's invasion and was finally totally defeated in the battle of the Grampians 86.

**Galiani,** FERDINANDO, 1728–1787. Italian savant and economist; prebendary of Amalfi 1752, Sec. of Neapolitan legation in Paris 1759–69; Finance Minister 1782. *On Money,* 1750; *Trade in Grain,* 1768.

**Galicia.** Old province of n.w. Spain, divided 1833 into four; a kingdom 411–585.

**Galicia.** N.e. province of Austrian Empire, inhabited mainly by Slavs. It belonged to Poland 1382–1772. Area 30,307 sq. m.; pop., 1890, 6,607,816.

**Galignani,** JOHN ANTHONY, 1796–1873, and WILLIAM, 1798–1882. English publishers in Paris. They enlarged the *Messenger,* founded 1814 by their father, an Italian.

**Galilee.** N. province of Palestine, between the Mediterranean and the Jordan; more fruitful than Judæa. Its Jewish inhabitants were bold, simple, and more open than those of Jerusalem to the teachings of Christ, who was brought up among them.

**Galilee,** SEA OF. See GENNESARET.

**Galilei,** GALILEO, 1564–1642. Prof. Pisa 1590–91, Padua 1592. A universal genius, pursuing in his younger days with equal success music, painting, literature, medicine and philosophy. At 20 he chanced to hear a lecture by Ostilio Ricci on geometry, of which he was till then ignorant; this turned his whole attention to mathematics and physics. His contributions to science constitute a long list of most important discoveries in physics, mathematics and astronomy. Mention can only be made of his difficulties with the ecclesiastical powers and his

Galileo Galilei.

recantation of the Copernican theory at the age of 69. He early studied the motion of a pendulum and applied it to count the pulse beats. He invented a thermometer, and in 1609 a telescope, the idea probably suggested by the discovery of a Dutch optician. For his defense of the Copernican system he was imprisoned at Rome, made to recant 1633, and forbidden to publish or receive friends. In 1637 he became blind. The most important of his scientific achievements are the discovery of the Laws of Motion and the laying of the foundation of Mechanics.

**Galilei,** VINCENZO, ab. 1533–1600. Father of the preceding, lutist and violist, one of the Florentine inventors of the opera. See LYRIC DRAMA.

**Galingale.** Sedges of the genus *Cyperus,* marsh-plants of wide geographical distribution.

**Galipot.** Glazed, and frequently painted, earthenware pot in which medicaments or preserves are kept.

**Galitzin,** or **Gallitzin,** DMITRI AUGUSTINE, PRINCE, 1770–1840. Son of the Russian Ambassador to France, and grandson of the Prussian general, Count von Schmettau. He became a priest 1795 in the U. S., retired to the Alleganies, founded Loretto, Cambria co., Pa., and spent his life in the humble labors of a missionary, known as "Father Smith."

**Gall.** 1. The bile. 2. Gall bladder.

**Gall,** FRANZ JOSEPH, 1758–1828. German physician, founder of phrenology. Silenced in Vienna, he traveled for a time with his pupil, Spurzheim, lecturing in several countries, and settled at Paris 1807. *Anatomy and Physiology of the Nervous System,* 4 vols., 1810–19, tr. 1835. *Functions of the Brain,* 6 vols., 1825.

**Gall,** ST. Irish monk, founder ab. 613 of a monastery, which transmitted his name to a Swiss canton. Its monks were long eminent as transcribers, illuminators, and musicians.

**Gallagher,** WILLIAM DAVIS, 1808–1894. American poet and journalist. *Erato,* 1835–37; *Miami Woods,* 1881.

**Gallait,** LOUIS, 1810–1887. Belgian historical painter.

**Galland,** ANTOINE, 1646–1715. Orientalist; prof. Coll. of France 1709; first European translator of the *Arabian Nights,* 1704–8. Tr. *Fables* of Bidpai and Lokman 1724; *Journal at Constantinople* (*1672–73*), 1881.

**Galland,** PIERRE VICTOR, 1822–1892. French decorative painter.

**Gallas.** African race of many tribes, numbering in all perhaps 3,000,000, living s. of Abyssinia, which they overran in 16th

Galla Types.

century. In religion they are partly Christian, partly Mohammedan, and partly pagan. They are warlike, intelligent, and industrious.

**Gallatin,** ALBERT, LL.D., 1761–1849. Statesman and financier, b. in Geneva; in the U. S. from 1780; M. C. from Pa. 1795–1801; able and eminent as Sec.-Treasurer 1801–13; negotiator, with Adams and Clay, of peace with England 1814; U. S. Minister to France 1815–23, and to England 1826–27.

**Gallaudet,** THOMAS HOPKINS, LL.D., 1787–1851. Founder and head, 1817–30, of the asylum for deaf-mutes at Hartford, Conn. Much work for the same cause has been done by his sons, THOMAS, D.D., b. 1822, rector St. Ann's Ch., New York, 1852–92, and EDWARD MINER, LL.D., b. 1837, founder and pres. of the Deaf-Mute College at Washington, D. C., 1864.

**Gall Bladder.** Receptacle on under surface of the liver, which receives and stores up the bile. It connects by a canal (the bile duct) with the intestine near its junction with the stomach.

**Galle,** or POINT DE GALLE. Town on s.w. coast of Ceylon, formerly of commercial importance. Pop., 1891, 33,505.

**Galle,** JOHANN GOTTFRIED, b. 1812. German astronomer, prof. Breslau 1851.

**Galleass.** Large variety of galley, having 300 rowers and 50 guns, once used by Spain.

**Gallego,** JUAN NICASIO, 1777–1853. Spanish poet.

**Gallein.** $C_{20}H_{10}O_7$. Phthalein, formed by the action of phthalic anhydride upon gallic or pyrogallic acid; dark green powder, soluble in hot water. It dyes mordanted cotton violet.

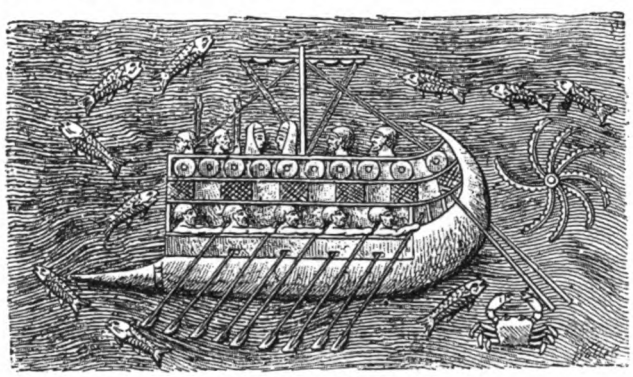
**Gallenga,** ANTONIO CARLO NAPOLEONE ("L. MARIOTTI"), 1810-1895. Italian, long resident in England. Besides several books on Italy, he pub. *Castellamonte*, 1854; *The Eastern Question*, 1877; *Pope and King*, 1879.

**Galleon.** Huge armed ships used by Spain in 16th century, 700-1,300 tons, high at the ends, main timbers four to five feet thick, and armed with brass and iron cannon. Many, bringing treasure from America, were taken by English rovers; others met the fate of the Armada.

**Galleries.** Underground passages by which military miners establish a powder chamber or reach a desired point. When these passages are vertical or greatly inclined, they are called shafts. The terms grand, principal, common, or branch, have reference to the dimensions, and transversal and listening to their object. Before beginning the construction, it is usual to prepare in advance a working sketch, and after computing the gallery intervals to provide the requisite frames, sheeting, etc. On reaching the crest of the covered way, the descent of the ditch is accomplished by a blindage until a depth of 9 ft. is secured; the remainder of the descent is finished by a gallery. —In Mining, horizontal passages.

**Gallery.** Long room or corridor giving access to other apartments, often open to the air on one side and at the ends. —Also a room intended for the display of works of art without reference to its shape or size.

**Galleys.** Vessels used from remote times till ab. 1690,



Phœnician War Galley.

rowed by slaves. They bore a prominent part in ancient naval warfare, and in that of the Bombay pirates. The condition of the rowers, whether convicts or captives, was pitiable.

**Gall-Fly.** See GALLICOLÆ.

**Galli.** Phrygian priests of Cybele, Phrygia. They celebrated the procreative principle in nature by impure orgiastic rites, accompanied with scourging and self mutilation. They came to Rome 204 B.C.

**Gallia,** or GAUL. Region anciently occupied by GAULS (q.v.) or Celts; divided by Romans into Transalpine, now (in substance) France, and Cisalpine, n. Italy.

**Galliard.** Dance formerly popular in w. Europe; identified with the Italian Romanesca.

**Gallicanism.** System, long prevalent in France, which held the Pope inferior to a General Council, and rigorously defended the liberties of the French Ch.

**Gallic Acid.** $C_6H_2(OH)_3(CO_2H)$. Dibasic acid, prepared by boiling tannin with dilute acid. It crystallizes in fine silky white needles, soluble in water, and acts as a reducing agent, absorbing oxygen with ease, hence it is used in photography.

**Gallicola** (GALL-INSECTS). Tribe of *Terebrantia*, having a stalked abdomen, usually short and laterally compressed, and a retractile ovipositor. The eggs are deposited by boring into plant tissues. This, by the irritation of an acrid fluid, causes the abnormal growths known as galls, in which the footless and aproctous larvæ develop. Many Gall-Wasps (*Cynipidæ*) are parthenogenetic. The oak galls of Asia Minor furnish tannic acid, the basis of many inks, dyes, etc.

**Gallicolæ** (GALL-FLIES). NEMOCERA (q.v.). The eggs are deposited in the tissues of leaves, etc., by the piercing ovipostor, and cause the tissues to grow abnormally about the eggs, forming a protection and furnishing food to the larvæ. To this group belongs *Cecidomya destructor* or HESSIAN FLY (q.v.). The larva of another *Cecidomya* exhibits the remarkable phenomenon of pædogenesis.

**Gallienus,** PUBLIUS LICINIUS, 218-268. Son of Valerian; Cæsar 253, Emperor 260; an accomplished, but careless man, indifferent to his interests and duties. Troubles thickened till little more than Italy and Egypt were left to him; the outlying provinces fell into anarchy, or were defended from the barbarians by the beneficent usurpers called "30 Tyrants." His coinage is peculiarly abundant, especially the small or 3d bronze, then first largely issued.

**Galliffet,** GASTON ALEXANDRE AUGUSTE, MARQUIS DE, b. 1831. French general.

**Gallinacei** (CLAMMATORES, GALLINÆ, or RASORES). Order of Birds living mostly on the ground, and rarely flying. The body is stout, the wings short and rounded, the beak strong and arched, with the tip bent down. The feet are short and powerful, fitted for scratching and perching. The male possesses a spur on the metatarsus above the hind toe, and is usually highly ornamented as to plumage, combs, and wattles. they are good runners, and feed principally on seeds and insects. They are polygamous usually. The hen lays many eggs in rude nests on or near the ground in concealed places. The young are usually præcoces. Many are domesticated. The more important families are the *Phasianidæ* (Fowls) and *Tetraonidæ* (Grouse). *Meleagris*, *Tinamous*, and the *Megapodiidæ* also deserve notice. They fall into two groups, the *Alectoromorphæ* and *Turnicimorphæ*.

**Gall Insects.** See GALLICOLA.

**Gallinule.** See RALLIDÆ.

**Gallio.** Brother of Seneca; Proconsul of Achaia 53. He refused to hear a trivial charge against St. Paul (Acts xviii. 12-17), and has been much belied in consequence.

**Galliot.** Originally a small, swift galley, now a Dutch two-masted, flat-bottomed cargo ship, carrying a large gaff-mainsail.

**Gallipoli.** First European conquest of the Turks 1356. It is 130 m. s.w. of Constantinople on the Hellespont, has two

Gallipoli.

fine harbors with considerable but declining trade, and is the headquarters of the Turkish fleet. Pop., 1890, 15,500.

**Gallisonnière,** ROLAND MICHEL BARRIN, MARQUIS DE LA, 1693-1756. Gov.-gen. of Canada 1745-49, which he connected with La. by forts and trading-posts. His sea-fight with Byng, 1756, led to the death of both.—His nephew, COUNT AUGUSTIN FELIX, 1742-1828, was a soldier, writer, and public man.

**Gallitzin.** See GALITZIN.

**Gallium.** Ga. At. wt. 69.9, Sp. gr. 5.9, Sp. ht. .079. Mpt. 30° C. Its discovery (by Boisbaudran 1875) had been predicted by Mendeléeff. It is a metal of bluish-white color, is not tarnished by the air, and forms two classes of compounds, gallous and gallic; in the former it is bivalent, in the latter trivalent. It is soluble in hydrochloric acid and caustic potash.

**Gallium Bromide.** See GALLIUM CHLORIDES.

**Gallium Chlorides.** $GaCl_2$. Gallous Chloride. White, transparent crystals. Mpt. 164° C. Made by heating gallium gently in chlorine.—$Ga_2Cl_6$. Gallic Chloride. Long, white needles. Mpt. 75.3° C. Made by heating gallium strongly in chlorine; purified by repeated distillations in nitrogen.

**Gallium Nitrate.** $Ga_2(NO_3)_6$. White substance, made by dissolving the metal in nitric acid. Mpt. 110° C.

**Gallium Oxide.** $Ga_2O_3$. White powder, made by heating the nitrate. Easily decomposed by fusion with caustic potash.

**Gallium Sulphate.** $Ga_2(SO_4)_3$. Similar to aluminium sulphate, but decomposed by boiling water. With ammonium sulphate it forms an alum, $GaNH_4(SO_4)_2+12H_2O$.

**Gallocyanine.** $C_{15}H_{12}N_2O_5$. Fast violet, product of the action of nitrosodimethylaniline on gallic acid or tannin; bronze-colored powder, insoluble in water. It dyes wool and cotton a violet color upon a chromium mordant.

**Galloflavine.** $C_{13}H_6O_9$. Substance produced by oxidation of gallic acid by the action of the air upon it in solution; yellowish paste, used to dye a fast yellow upon cotton mordanted with oxide of chromium; insoluble in water and of unknown constitution.

**Gall of the Earth.** See LION'S FOOT.

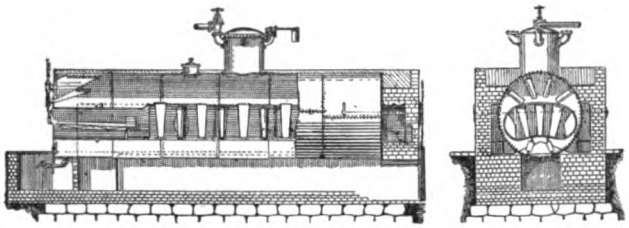
**Gallon.** Unit of liquid measure from remote times; of varying capacity till 1824–26, when it was fixed in England at 10 lbs. of distilled water, or 277.274 cubic inches. U. S. gallon has a capacity of 231 cubic in.

**Gallotannic Acid.** See TANNIN.

**Galloway.** See CATTLE.

**Galloping Consumption.** Consumption running a very rapid course. See CONSUMPTION and TUBERCULOSIS.

**Galloway Boiler.** Form of FLUE BOILER (q.v.) in which conical water tubes are inserted across the fire-flue. The water tubes are so tapered that the flange at the smaller end is of less diameter than the larger end above the flange: hence repair



Galloway Boiler.

can be made more easily to a middle tube. The boiler is moreover made with special provisions that it shall not be strained by unequal expansion of its parts. The vertical or inclined water tubes form a very efficient heating surface.

**Gallowglasses.** Heavy armed soldiers, or retainers of an Irish or Gaelic chieftain, ab. 14th century.

**Gallows.** Cross bar on uprights to which is attached a rope for hanging criminals. In old times the victim with the rope around his neck mounted a ladder with the hangman, who threw him off. At present a trap door falls beneath him and his neck is broken by the jerk of the rope.

**Gallows Frame.** Structure carrying the pulleys over which the hoisting-cable runs from the engine house to the mouth of a mine shaft; also called head frame.

**Gall-Stones.** Concretions, consisting almost exclusively of cholesterine, which form in the gall-bladder. They often prevent the flow of bile into the intestine, causing jaundice, or may in their passage through the bile duct give rise to intense pain (bilious colic).

**Galluppi,** PASQUALE, 1770–1846. Prof. Naples 1831; writer on philosophy.

**Gallus,** CAIUS AQUILIUS. Prætor 66 B.C.; jurist, cited and praised by Cicero.

**Gallus,** CAIUS CORNELIUS, ab. 66–26 B.C. Latin elegiac poet, first Roman Gov. of Egypt, then exiled and a suicide. His works are not extant.

**Gallus,** CAIUS VIBIUS TREBONIANUS, 206–253. Roman Emperor 251. He bought peace from the Goths.

**Gallus,** FLAVIUS CLAUDIUS CONSTANTIUS, 325–354. Cæsar 351; brother of Julian; executed.

**Gall-Wasp.** See GALLICOLA.

**Galmei.** Oxidized zinc ores, now known as CALAMINE and SMITHSONITE (q.v.).

**Galt,** JOHN, 1779–1839. Scottish writer, mainly of fiction. Of his 44 books, some of the best, including *Ayrshire Legatees*, *Annals of the Parish*, and *The Provost*, appeared 1820–25. *Lawrie Todd*, 1830; *Life of Byron*, 1830; *Autobiography*, 1833.—His son, SIR ALEXANDER TILLOCH, LL.D., 1817–1893, was prominent in Canadian affairs, twice Minister of Finance, and Commissioner in England 1880–83.

**Galton,** FRANCIS, F.R.S., b. 1824. Grandson of Dr. E. Darwin; Sec. British Association 1863–68; pres. Anthropological Institute 1885–86; devoted to researches in statistics and sociology. *Tropical S. Africa*, 1853; *Art of Travel*, 1855. In *Meteorographia*, 1863, he introduced the term anticyclone into meteorology. His *Hereditary Genius*, 1869, and later books, have made him an authority on heredity. *Finger-prints*, 1892–93.

**Galton's Anticyclonic Law.** Generalization announced 1863, from study of synoptic weather charts, that in regions where the barometer is above the average the wind is outward and around in a manner constituting an ANTICYCLONE (q.v.).

**Galuppi,** BALDASSARE, called BURANELLO, 1706–1784. Italian composer, chiefly of operas; chapelmaster at St. Mark's, Venice, director of the Conservatorio degl' Incurabili, and conductor of the Imperial Opera in St. Petersburg 1765–68.

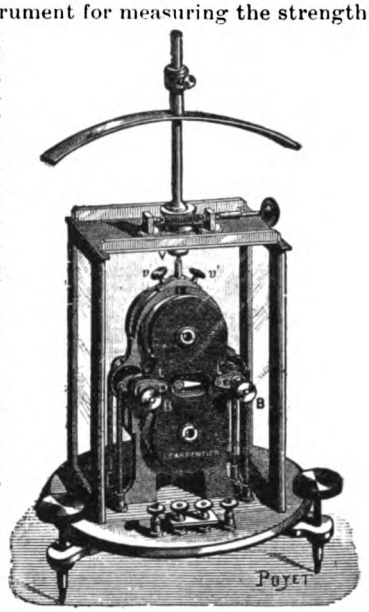
**Galvani,** LUIGI, 1737–1798. Italian physiologist, from whose name is derived a class of physical terms employed in electrical science. He enunciated a celebrated theory of animal electricity in a treatise pub. 1791. His noted rival was Volta, who insisted that the phenomena observed were due to the conjunction of two dissimilar metals used in the experiments.

**Galvanism.** Department of electrical science which treats of the phenomena developed by the contact of dissimilar bodies, or resulting from the chemical action between different substances.

**Galvanized Iron.** Iron coated with zinc to protect it from rusting; it is cleaned with dilute sulphuric acid and dipped in melted zinc; mainly used for thin plates, wire, and water-pipes.

**Galvano-Cautery.** See ELECTRIC-CAUTERY.

**Galvanometer.** Instrument for measuring the strength of electric currents. It consists of one or more coils of insulated wire in which a current produces a magnetic field. In the center of this a magnetic needle is suspended, and from the angle of deflection of this needle the intensity of the current is calculated. If the instrument is used as a tangent galvanometer, or tangent compass, the plane of the coil is parallel with that of the meridian during the experiment, and the current strength is given by the formula $C=\frac{H r}{2 \pi n} \tan a$; in which H is the horizontal component of the earth's magnetic force, r the mean radius of the coil, n the number of turns, and $a$ the angle of deflection. The co-efficient $\frac{H r}{2 \pi n}$ is called the reduction factor of the galvanometer, usually denoted by k. The galvanometer constant is denoted by $\frac{2 \pi n}{r}$, or it may be defined as the strength of the magnetic field at the center of a coil due to a unit current flowing through it. If the coil be turned about a vertical axis till its plane is coincident with that of the deflected needle, $C=k \sin a$, and the instrument is known as the sine galvanometer. If a tangent galvanometer be constructed with a short, heavy needle, and if a very brief current be passed through the coil, the needle will receive an impulse causing it to swing through a maximum angle $a$. When used thus the instrument is termed a ballistic galvanometer, and the quantity of electricity which produced the throw $a$ is given by the equation $Q=\frac{2 H}{G} \cdot \frac{T}{\pi} \sin \frac{a}{2}$, in which T is the time of a complete oscillation of the needle and G is the galvanometer constant. The Thomson galvanometer is a very delicate and sensitive instrument. The needle is very light and is delicately suspended in the center of a circular coil of wire. To the needle a small mirror is attached, and by watching the reflection of a beam of light upon a scale, any motion of the needle may be detected.



Modified Thomson Galvanometer.

**Galvanometer Constant.** See GALVANOMETER.

**Galvanoplasty.** See ELECTROMETALLURGY.

**Galvanoscope.** Appliance for detecting the presence of an electric current; distinguished from a GALVANOMETER (q.v.), which is a measuring instrument. Also called Test Galvanometer.

**Galvanotropism.** Phenomena of curving or rotation exhibited by organs of plants exposed to the action of electrical currents.

**Galveston.** Chief seaport and second largest city of Texas, capital of Galveston co., on a reef between the Gulf of Mexico and Galveston Bay, founded 1838. It has a large export trade, mainly of cotton. Pop., 1890, 29,084.

**Galvez y Gallardo,** BERNARDO, 1746–1786. Spanish Gov. of La. 1779; Captain-gen. of La., Fla. and Cuba 1781; Count and Viceroy of Mexico 1783.

**Galway.** Fisning town on the n. coast of Galway Bay, w.

Galway.

Ireland, at the mouth of the River Corrib. It is a picturesque town with declining commerce. Pop., 1891, 13,746.

**Gama,** VASCO DA, ab. 1469–1525. Portuguese seaman, whose voyages to Asia, 1497–99 and 1502–3, laid the foundations of an empire; Admiral of the Indies 1499; Viceroy 1524.

**Gama Grass.** *Tripsacum dactyloides.* Large marsh grass, native of the s.e. U. S.; known also as Sesame Grass.

**Gamaliel.** Jewish rabbi of high authority, whose counsel (Acts v. 34-40) probably saved the Apostles' lives. St. Paul was his pupil.

**Gamarra,** AUGUSTIN, 1785–1841. Pres. of Peru 1829–33 and 1839; exiled 1835; killed in war with Bolivia.

**Gamba.** See VIOLA DA GAMBA.

**Gambeson.** In Armor, a tunic stuffed with wool and quilted, generally worn beneath the knight's hauberk as a pad-

Gambesons of the 14th century.

ding for plate-armor. The surcoat was also sometimes gamboised with cotton.

**Gambetta,** LEON, 1838–1882. French statesman; Deputy 1869; Member of the Provisional Government of Sept. 4, 1870, and Minister of the Interior. He escaped from Paris in a balloon Oct. 8, obtained a loan from London capitalists and organized the two armies of the Loire and the North. He was again a member of the Chamber 1871, its Pres. 1879–81, and Premier 1881.

**Gambia.** River of w. Africa, partly navigable for ab. 400 m. About its mouth, at Bathurst, lat. 13° 25′ N., is a British settlement.

**Gambier.** *Uncaria gambir.* Slender climbing shrub of the natural family *Rubiaceæ*, native of Malaya; cultivated for its leaves, which yield the commercial article gambier. Used in dyeing browns, tanning, and in medicine as an astringent.

**Gambier Islands.** Small group in the Pacific 23° 15′ S. lat., 134° 45′ W. long., under French protection since 1844. They are important as being, besides Pitcairn Island, the only place between Chili and Tahiti where fresh water may be procured. Pop. ab. 500.

**Gambling.** References to gambling as such are constant in most early histories and mythologies both of Asia and aboriginal America. Its origin is frequently attributed to the gods or to mythical heroes, and certain festivals are usually devoted to it. The gods thought to preside over it are almost invariably those of war and fate. Although originally sacred, the practice has been condemned by most moral and religious teachers from the earliest historic time, and at the present day is restricted or absolutely forbidden by the laws of most civilized countries. Generally prohibited by statute in Britain and the U. S.; gambling houses are deemed nuisances, and gambling implements may be confiscated by summary proceedings. In England, after a vain struggle to suppress gambling, the law tried to regulate it, and gambling-houses were licensed in London 1620. All private faro, basset, and hazard tables were suppressed 1739, but they were run nevertheless. In 1788 the season's profits at a private house were estimated at $750,000. Three peeresses were convicted of keeping a faro table and fined $250 each 1797. In Paris houses were licensed till 1838. The public tables at Wiesbaden and Homburg were closed 1872, and the famous Casino at Monte Carlo is the only one now remaining.

**Gamboge.** Gum-resin derived from plants of the genus *Garcinia*, natural family *Guttiferæ*, natives of s. Asia. The fruit yields an oil called Gamboge Butter.

Gamboge (*Garcinia morella*).

**Gambold,** JOHN, 1711–1771. English Moravian bishop 1754; editor *Hymns of the Children of God in all Ages*, 1754, long the largest English collection. He wrote a drama, *Ignatius*, and some notable lyrics. *Works*, 1789–1822.

**Gambrinus.** Legendary King of Flanders, credited in popular song with having invented beer; his cask and foaming mug are familiar accessories.

**Game Laws.** Passed in England 1496; greatly modified 1831 and 1862. A game license for a year costs £3, for 14 consecutive days £1. In the U. S. the right to kill game is limited in some States by Close Seasons, when hunting and trapping are prohibited, and generally by the necessity to avoid trespassing. In Great Britain these laws tend to secure to the landed class a monopoly of killing game; in the U. S. their object is twofold, to prevent the extinction of game, and to give all hunters equal rights.

**Games.** See BAGATELLE, CRICKET, DRAUGHTS, GOLF, etc.

**Games,** GRECIAN. See GRECIAN GAMES.

**Games of Cards.** See CARDS, ALL FOURS, CASINO, etc.

**Gametes.** Conjugating cells of Fungi of the sub-class *Zygomycetes*; also any sexually uniting or generative cells; *i.e.*, ova (eggs) and spermata (spermatozoa and antherozoids).

**Gametogenesis.** Production of gametes or their life history, including ovogenesis and spermatogenesis.

**Gametophyte.** Phase of any plant which bears the reproductive organs, especially *Bryophyta* and *Pteridophyta*.

**Gamma Function.** So called from its symbol Γ. (n): integral between the limits x=o and x=infinity of the expression $e^{-x}x^n dx$. If n be a positive integer, the integral equals factorial n. ( |n)

**Gammarus.** See CREVETTINA.

**Gammon Theological Seminary.** At Atlanta, Ga.; controlled by M. E. Ch. S. It has 4 professors and 9 lecturers.

**Gamogenesis.** Reproduction by means of sexual cells; *i.e.*, by fecundation. There are two kinds, Diœcious or gonochoristic, and Monœcious or hermaphroditic.

**Gamopetalous.** Corolla whose petals are more or less united.

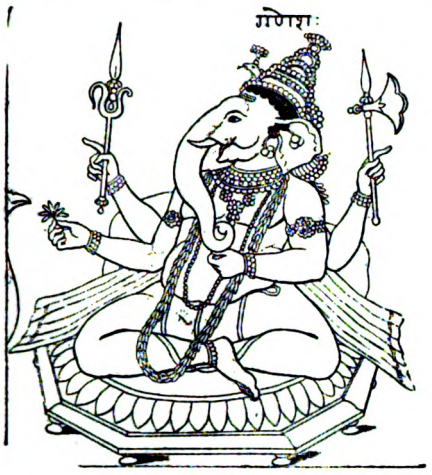
**Gamosepalous.** Calyx whose sepals are more or less united.

**Gamut.** The musical scale, so called from the arrangement of Guido of Arezzo in the 11th century.

**Gando.** Fellata sultanate on the Niger, w. Africa, between 11–14° N. lat. Area 78,500 sq. m. The people are principally engaged in agriculture. Pop. ab. 5,500,000.

**Ganesa.** Hindu God of prudence and policy, and the patron of letters; the eldest son of Siva and Parvati, his wives are

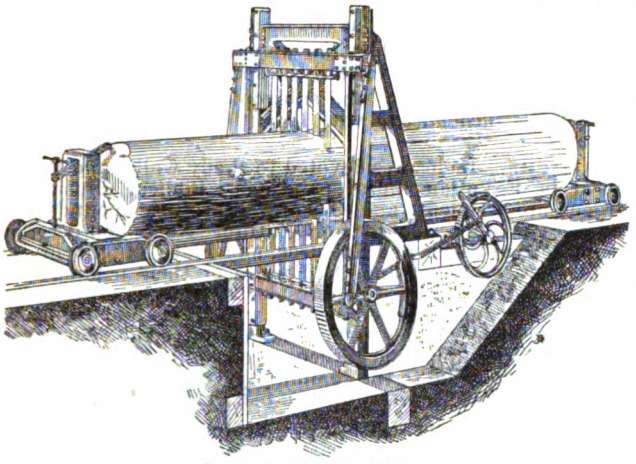
Siddhi and Buddhi, Knowledge and Understanding. He is usually represented as a short, fat, red man with a large belly and




Ganesa.

the head of an elephant, an emblem of sagacity. He has variously 2, 4, 6, or 8 hands.

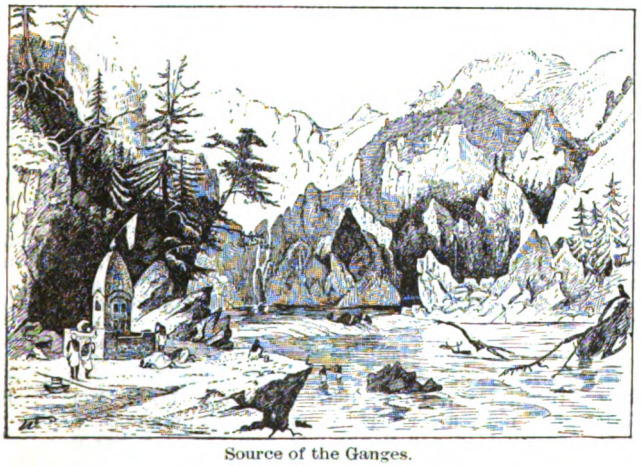
**Gang Drill,** GANG PUNCH, GANG SAW. Machines of the several classes in which one holder or frame holds a number of tools which all act at once. The advantages for the saw are that in the time necessary for one traverse of the feed gear a



Reciprocating Gang Saw.

number of slabs have been cut at once and of uniform thickness; for the punch and drill, the time for locating the holes properly on the work is saved, and one presentation to the tool answers for several holes, at the same distance apart and in proper relation to each other, if not in one line.

**Ganges.** One of the great rivers of Asia. With its main branch, the Brahmapootra, it drains nearly all of both the n.



Source of the Ganges.

and s. slopes of the Himalayas and much of the plateau of Thibet. It flows into the head of the Bay of Bengal through a large and complex delta. Length of main stream 1,500 m.; mean discharge at a point 500 m. from its mouth 233,000 cubic ft. per second. Drainage area of Ganges and Brahmapootra combined, 752,300 sq. m.

**Ganglion.** 1. Knot-like mass of nervous cells from which nerve fibers proceed. It may receive stimuli and be Sensory, or may send out impulses and thus be Motor. See SUPRA-ŒSOPHAGEAL GANGLION and PEDAL GANGLION. 2. A weeping sinew. 3. Mycological term for short processes borne on the mycelium of Fungi.

**Ganglionic Nervous System.** See SYMPATHETIC NERVOUS SYSTEM.

**Gangotri.** Hindu temple 8 m. below the source of the Ganges. On account of its inaccessibility the water, which here is peculiarly sacred to pilgrims, is bottled and exported.

**Gangrene.** Mortification, or the death in mass of a part; called moist or dry, according as the affected parts contain much or little fluid. It is caused by a shutting off of the blood supply by injuries to the vessels, or destruction of the vitality of the parts by burns, extreme cold, etc., or by some influence exerted through the nerves. Hospital gangrene is a contagious form, and senile gangrene a variety sometimes seen in the aged, due to feebleness of the circulation or disease of the blood vessels.

**Gangue.** Non-metalliferous minerals associated with metallic ores in veins or beds; vein-stone. The most common are calcite, quartz, barite, and fluorite.

**Gangway.** 1. That part of a ship's side where persons enter and depart; also called the waist. 2. Roadway in a mine.

**Ganister.** Hard, silicious fire-clay used for lining furnaces, converters, etc.

**Gannet** (SOLAN GOOSE, BOOBY). Of order *Steganopodes*, family *Sulidæ;* large, white bird, living in the n. Atlantic, with wings like a swallow. It subsists on herrings, and feeds

Gannet (*Sula bassana*).

its young with fish disgorged from its own crop. It breeds on rocky islands, *e.g.*, in the Gulf of St. Lawrence, in vast rookeries.

**Gannett,** HENRY, b. 1846. Assistant in U. S. Geological Survey 1872–78; Chief Topographer U. S. Geol. Survey 1889; expert in charge of Statistical Climatology for the 10th (1880) and 11th (1890) census; author of charts of temperature and rainfall for the U. S.

**Ganocephala.** See LABYRINTHODONTA.

**Ganoidei.** Fishes with cartilaginous or bony skeleton; the caudal fin is heterocercal or diphycercal; have rhomboidal, regularly-set, enameled scales (or bony dermal plates and fulcra); a heart having a conus arteriosus, with several rows

of valves; a spiral valve in the intestine, and paired abdominal pores; comb-like gills on free arches, as in Teleosts, but also having an apercular gill as well as a pseudobranch in the spiracle, and a swim-bladder, which may be lung-like, always open to the œsophagus. The ova pass out through Mullerian ducts. The Ganoids were especially abundant in the Devonian Age. Four tribes are included: *Chondrostei, Crossopterygii, Euganoides*, and *Amiades*. See also CEPHALASPIDEA, PLACODERMI, HOLOSTEI, and ACANTHODIDÆ.

Ganymede (by Correggio).

**Ganoid Scales.** Composed of a lower layer of true bone, covered by an upper layer of polished enamel; present in sturgeons and gar-pikes.

**Ganymede.** Most beautiful of mortals; carried off to Olympus by Jupiter in the form of an eagle, to succeed Hebe as his cupbearer. The Rape of Ganymede formed a favorite subject for sculptors and painters, Correggio's picture being the most celebrated.

**Gapes.** Disease of fowls, turkeys, pheasants, and many birds, caused by the presence of large numbers of worms (*Sclerostomum tracheale*) in the windpipe, which cause gasping and suffocation. May be relieved by removing worms with a feather, etc., or instilling a few drops of petroleum.

**Gapogari.** Sorcerers in India who are supposed to have the power of causing rain; weather charmers.

**G. A. R.** See GRAND ARMY OF THE REPUBLIC.

**Garabit.** Gorge of the Truyère in the department of Cantal, France, across which M. Eiffel constructed a famous railway viaduct 1,852 ft. long, 401 ft. above the stream. The arch has a span of 541 ft. 4 in.

**Garancin.** Extract of madder prepared by treating the root with sulphuric acid. It contains alizarin and purpurin.

**Garatki.** The game of "Little Towers," a favorite with boys throughout Russia. The players divide into two sides, Two diagrams each ab. 6 ft. square are drawn on the earth ab. 20 ft. apart, with a line in the middle between. Five wooden billets ab. 8 in. in length are piled in each square. The players stand in their own inclosures, and endeavor to knock out their opponents' blocks by throwing small clubs.

**Garay,** JANOS, 1812–1853. Hungarian poet and dramatist. *Sketches*, 1845.

**Garb.** Old word of a sheaf of any kind of grain, still retained in Heraldry.

**Garbage Disposal.** Furnaces for burning garbage were first used in the U. S. at military posts ab. 1880. In 1885 one was built at Governor's Island which consumed from 10 to 30 cubic ft. per day on a grate through which the fire passed, and another at Allegheny, Pa., in which natural gas was used. Furnaces have since been put into operation at Pittsburg, Montreal, Des Moines, Buffalo, Detroit, Chicago, Atlanta, and other cities. Cremation is a far more effective method of garbage-disposal than that of dumping it into rivers and harbors, though generally more costly. Another method of disposal is to extract the fat from the dried garbage with naphtha, the residue being sold as a fertilizer. The naphtha is recovered by distillation from the fat.

**Garbo,** RAPHAEL DEL, 1466–1524. Italian painter.

**Garcao,** PEDRO ANTONIO CORREA DE, 1735–1775. Portuguese poet, noted for his sonnets, odes, and satires.

**Garcia,** JOSEF, 1656–1712. Spanish artist, court-painter 1703.

**Garcia,** MANUEL, 1775–1832. Spanish tenor, composer of *The Caliph of Bagdad* and other operas.—Of his children, MANUEL, b. 1805, was a noted teacher; MARIA became MME. MALIBRAN (q.v.); and PAULINE, Mme. Viardot, b. 1821, was a singer and composer.

**Garcia-Moreno,** 1821–1875. Pres. Ecuador 1861–65 and from 1869; devoted to the clerical interest.

**Garcilaso de la Vega,** called "THE INCA," 1540–1616. Historian of Peru; son of a Peruvian princess and a Spanish officer; in Spain from 1560. *Royal Commentaries*, 1609–17, tr. 1688 and 1869.

**Garcilaso de la Vega,** 1503–1536. Related to the preceding. Spanish lyric and pastoral poet. His 37 sonnets and few other pieces are highly valued. He was mortally wounded while storming a castle in Provence.

**Garcin de Tassy,** JOSEPH HÉLIODORE SAGESSE VERTU, 1794–1878. Prof. Paris 1838; writer on the religion and literature of India 1832–37, Persian poetry 1864, and Oriental languages.

**Garda.** Largest lake in Italy, area 115 sq. m., between Venetia, Lombardy and the Tyrol. It is celebrated for the

Lake Garda.

beauty of its scenery and salubrity of its climate. It is studded with islands and many villas dot its shores.

**Gardant.** In Heraldry, an animal is said to be gardant when the face is turned toward the spectator.

**Gardenia.** Tropical and subtropical trees and shrubs of the genus *Cinchonaceæ*, with beautiful and sweet-scented blossoms.

**Gardens.** Inclosures devoted to shady walks and flowers appear in Egyptian mural paintings. Biblical allusions to gardens are frequent, and Oriental literature abounds with evidences of a passion for horticulture. Xenophon describes the gardens of Sardis and Epicurus, and Plato taught in gardens. Horace, Virgil and Ovid write of their popularity in Rome, and the Garden God presided at riotous orgies. The Romans introduced gardening into w. Europe, and during the Middle Ages every abbey and castle maintained it. Now every large city keeps up public gardens on account of their healthful and recreative value to the community. See BOTANICAL GARDENS, PUBLIC PARKS, KEW, JARDIN DES PLANTES, etc.

**Gardiner,** JAMES, 1688–1745. Scotch colonel, noted for youthful profligacy and a remarkable conversion 1719, recorded by Dr. Doddrige; killed at Prestonpans.

**Gardiner,** JAMES TERRY, b. 1842. Civil and topographical engineer, topographer U. S. Geological Survey 1867–75.

**Gardiner,** SAMUEL RAWSON, b. 1829. Prof. King's Coll., London; historian of England from James I. to the Civil War. His six works on this subject, 1863–86, were collected in 10 vols. 1887. *Cromwell and the Protectorate*, 1894.

**Gardiner,** STEPHEN, 1483–1555. Bp. of Winchester 1531, Lord Chancellor 1553; associated with Bonner in the Marian persecutions.

**Gardner Gun.** Machine gun consisting of two bolt guns placed side by side, and surmounted by a magazine. The bolts which drive the cartridge home, and carry the firing pin and extractor, are operated by a transverse shaft or lock cam turned by a hand crank. One bolt is made to advance while the other retires, except at a certain point, when both are stationary; at this instant a cartridge is fired, and another drops from the feeding device into the well of the other barrel. The simplicity and accessibility of its mechanism and the lightness of the gun itself are its distinguishing features. Its rapidity of fire is not over 600 per minute, much less than the Gatling; a serious fault is in the dependence of the feed upon the motion of both bolts, since an accidental break in one bolt might disable the gun.

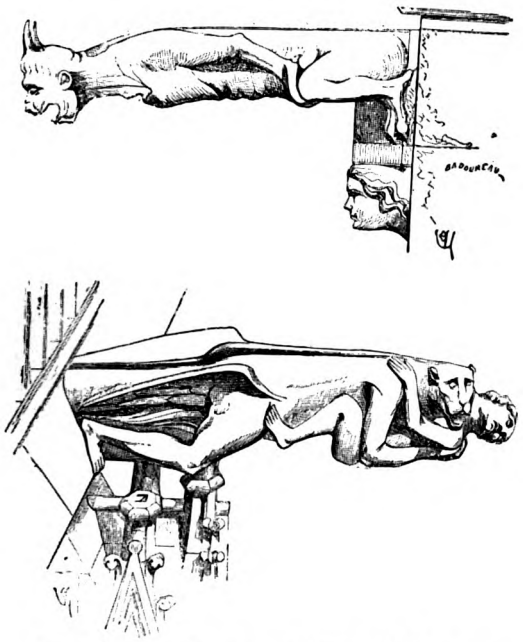
**Garefowl.** See ALEIDÆ.

**Garfield,** JAMES ABRAM, 1831–1881. Twentieth Pres. U. S.; Pres. Hiram Coll., Ohio, 1857; Brig.-gen. U. S. Vols. 1862; Major-gen. 1863, after service at Chickamauga; M. C. from Ohio 1863–80; leader in Republican politics; U. S. Senator 1880; Pres. 1881. He was shot by C. J. Guiteau July 2, and died Sept. 19.

**Garget.** See POKEWEED.

**Gargle.** Fluid, usually containing an astringent or antiseptic substance, which is held in the throat and made to reach all of its upper portion by forcing air out through it. It is employed in many diseases of throat and nose; also to perform the above.

**Gargoyle.** Ornamental termination of a spout in the cornice or parapet of an edifice to carry off the water from the



Gargoyles from Carcassone and Clermont, France.

roof. In mediæval Gothic and Renaissance architecture gargoyles are infinitely varied, with grotesque animal and human forms.

**Garhwal.** Native Indian state n.w. of the N.W. Provinces; area 4,164 sq. m. Tea is produced here. Pop., 1891, 241,242.

**Garibaldi,** GIUSEPPE, 1807–1882. Italian patriot, in exile for revolutionary agitation 1834–48. After defending Rome against the French 1849, he settled at Caprera. He seized Sicily in 1860, conquered Naples, transferred the Two Sicilies to Victor Emmanuel, and made several fruitless attempts to free Venice and Rome, but was captured by the French in 1867. He was in the service of the French Republic in 1870, and a member of Italian Parliament from 1875, resigned in 1880.

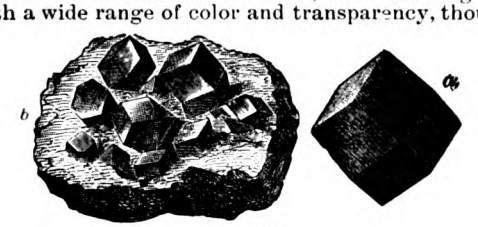
**Garigliano.** River in s. Italy, flowing into the Gulf of Gaeta. Near it the Spaniards defeated the French December 28, 1503.

**Garland,** AUGUSTUS HILL, LL.D., b. 1832. Gov. of Ark. 1875; U. S. Senator 1877–85; U. S. Attorney-gen. 1885–89.

**Garland,** HAMLIN, b. 1860. American novelist and critic. *Main-traveled Roads*, 1891; *Prairie Songs*, 1894: *Gambling Idols*, 1895.

**Garlic.** Certain bulbous plants of the genus *Allium* of the Lily family, related to the Onion; natives of the northern hemisphere; used for seasoning meat. *A. vineale*, the common Field Garlic of e. N. America, is a weed of European origin.

**Garnet.** Aluminium silicate, containing in addition one or more of several chemical elements, and occurring as a mineral with a wide range of color and transparency, though near-




Garnet:
*a*, a detached crystal; *b*, portion of rock with imbedded crystals.

ly constant in crystallization. The clear, red variety is known as precious garnet, and is valued as a gem. Other varieties are pyrope or Bohemian garnet, grossularite, and cinnamon stone.

**Garnett,** RICHARD, LL.D., b. 1835. English poet, essayist, and biographer; cataloguer of the British Museum. *Twilight of the Gods*, 1889.

**Garnier,** FRANÇOIS (MARIE JOSEPH), 1839–1873. French naval officer, explorer in Cambodia and s. China 1866; killed in Tonkin.

**Garnier,** JEAN LOUIS CHARLES, b. 1825. Architect of the Paris Opera House 1867–75. *Le Nouvel Opera*, 1878–80.

**Garnier,** JULES ARSÈNE, b. 1847. French historical painter.

**Garnier,** ROBERT, 1534–1590. French dramatist. *Works*, 1607.

**Garnierite.** Ore of nickel found in large quantity in New Caledonia; hydrous silicate with varying percentages of nickel, also containing magnesium.

**Garnier-Pages,** LOUIS ANTOINE, 1803–1848. French deputy 1841 and 1864; finance minister 1848; historian of the Revolution of 1848.—His brother, ÉTIENNE JOSEPH LOUIS, 1801–1841, was prominent in and after the Revolution of 1830.

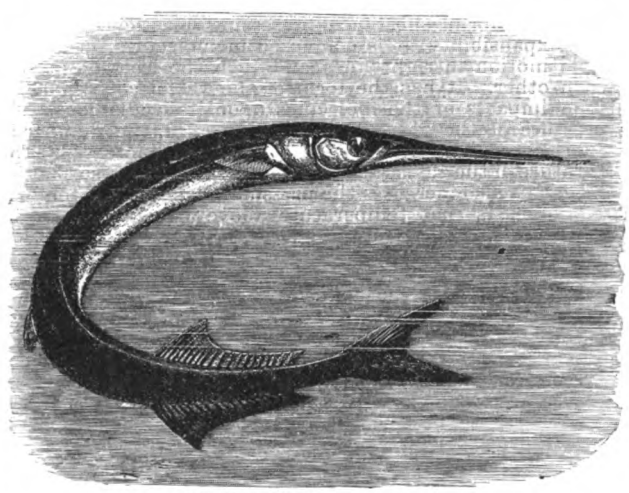
**Garnishment.** Legal proceeding by which a creditor obtains the benefit of his debtor's property in a third person's possession.

**Garofalo** (BENVENUTO TISIO), 1481–1559. Italian painter, imitator of Raphael. He has a fine entombment in the Borghese Palace at Rome.

**Garo Hills.** Highlands s. of the Brahmapootra on the w. frontier of Assam, India; area ab. 4,400 sq. m. They are covered with dense forests of the valuable sal tree.

**Garonne River.** Large river of s.w. France, heading in the Pyrenees, and flowing n.w. to Bordeaux, where it receives the Dordogne, and thence is known as the Gironde.

**Gar-Pike.** *Belone vulgaris.* Bony fish of the family *Scombresocidæ.* They swim with an undulating motion near the surface of the water, feeding on flies and small fishes. They



Gar-Pike (*Belone vulgaris*).

attain a size of from 2 to 4 ft. Found in the tropical and temperate seas. The name is also applied to the *Lepidosteus.* Also called Green Bone from the color of the bones after cooking.

**Gerraud,** GABRIEL JOSEPH, 1807–1880. French sculptor.

**Garrett,** GEORGE MURSELL, b. 1834. Organist to Cambridge Univ. 1875; composer of ch. music and cantatas.

**Garrett Biblical Institute.** Opened 1856 at Evanston, Ill., for theological study, by M. E. Ch. It has near 200 students.

**Garrick,** DAVID, 1717–1779. English actor of highest rank, prominent in London 1741–76. He wrote verse and adapted numerous plays.

**Garrison.** Troops stationed at any military post. In war, when an important position is to be held to the last extremity, the fortification must be so designed that the intimate relations which exist between the length of crest and interior space and the strength of the garrison will secure the work against the possibility of capture by open assault, and force the enemy to attempt its capture by regular approaches.

**Garrison,** WILLIAM LLOYD, 1804–1879. American reformer; founder of *The Liberator* 1831, and its editor till 1865; imprisoned in Baltimore 1830, mobbed in Boston 1835; Pres. American Anti-Slavery Society 1843–65. Through danger, narrowness, constant and violent opposition, he was faithful to the cause he had chosen, and he saw it triumph.

**Garrod,** SIR ALFRED BARING, M.D., b. 1819. Prof. King's Coll., London. 1863; medical writer. *Gout*, 1860.—His son, ALFRED HENRY, F.R.S., 1846–1879, prof. King's Coll. 1874, was an authority on bird anatomy.

**Garrotte,** or GARROTE. Spanish mode of execution. A cord placed about the neck is twisted with a stout stick until strangulation results; or a metallic collar is used provided with a screw which is turned till it enters the spinal marrow. Robbery, effected by choking the victim, is also called Garroting.

**Garter King of Arms.** Chief herald of England; also of the Order of the Garter. With the Earl Marshal he regulates the ceremonies of coronations and other state functions. The office is said to date from 1417.

**Garter,** ORDER OF THE. Founded in England 1344; sometimes called the Order of St. George. The principal emblem is the garter of blue velvet, worn just below the left knee, with the motto in gold letters, *Honi soit qui mal y pense.* Originally but 25 companions were eligible besides the sovereign. At present princes of the blood may be elected and others by special statute, as the Shah of Persia 1873. The knights write K. G. after their names.

Order of the Garter: Star, Collar and George, and Garter.

**Garter Snakes.** See WATER SNAKES.

**Garth,** SIR SAMUEL, M.D., 1660–1719. Physician to George I.; knighted 1714; author of a satire, *The Dispensary*, 1699, and other poems.

**Gärtner's Canal,** or DUCT. Rudiment of the Wolffian duct (vas deferens) in the female animal.

**Gas.** Aëroform substance possessing elasticity and indefinite expansibility; it is composed of molecules, in a state of rapid motion in right lines and with the least attraction for each other. It has the form of the vessel containing it, and the impacts of the molecules upon its walls constitute the pressure of the gas. If it is compressed, the number of impacts is increased, and thereby the pressure is increased. The temperature of the gas is the energy of the molecules, so that increase in this also increases the pressure. The critical temperature of a gas is that temperature above which it cannot be liquefied by increase of pressure alone and below which such liquefaction may take place. A gas cannot be liquefied at ordinary temperature by pressure alone, its critical temperature being below this; all the ordinary gases, with the possible exception of hydrogen, have been liquefied by pressure and low temperatures. Vapors may be liquefied at ordinary temperature by pressure, their critical temperatures being above that. Vapors do not conform to the laws of contraction and expansion for compression and temperature that apply to gases. See BOYLE'S LAW, CHARLES' LAW, GAY LUSSAC'S LAW, MARRIOTTE'S LAW, DIFFUSION, and EFFUSION.

**Gas.** See ILLUMINATING GAS, COAL GAS, and WATER GAS.

**Gasca,** PEDRO DE LA, 1485–1561. Viceroy of Peru 1546–50; sent to suppress the revolt of G. Pizarro; later Bp. of Palencia and Siguenza, Spain.

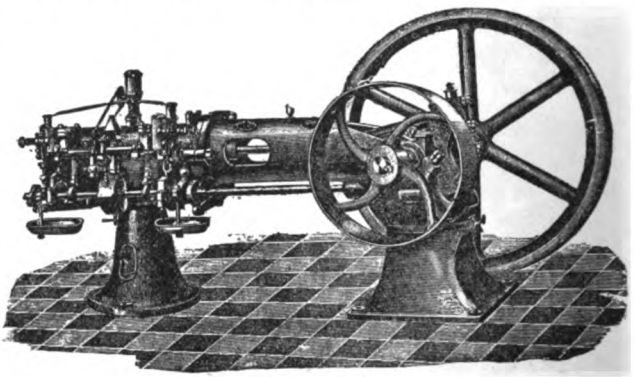
**Gas Coal.** Bituminous coal, rich in hydrogen and poor in oxygen. The amount and quality of the gas obtainable from different coals vary widely. An average yield from a ton of the better qualities in the U. S. is ab. 10,000 feet, with an illuminating power of sixteen candles. See COAL GAS.

**Gascoigne,** GEORGE, 1525–1577. English poet, pioneer of the Elizabethan Period.

**Gascoigne,** SIR WILLIAM, ab. 1350–1419. English Chief-justice 1400–13; noted for fearless uprightness, as in refusing to sentence Abps. Scrope and Mowbray to death 1405. Shakespeare's story of his arresting Prince Henry is in character and may be true; but Henry V. did not keep him in office.

**Gascony.** Old province of s.w. France: named from the Basques, who came from Spain ab. 550. Capital Auch. It comprised the present departments of Landes, Gers, Hautes-Pyrénées, and part of Basses-Pyrénées. Conquered by the Franks 602; subject to dukes of Aquitaine, and to the English 1152–1453. The Gascons are noted for their liveliness and boasting.

**Gas Engine.** Form of motor for small powers, in which the power is derived from a mixture of air and carbureted hydrogen gas in the driving cylinder. The desired amount of each fluid is admitted through graduated valves into the mixing cavity, and is there lighted either by a separate gas flame or by an electric spark. The gas mixture is either an explosive one, or else less gas is admitted, and the air is expanded by the ignition in it of the gas. Such engines are usually single-acting, requiring a large fly-wheel to equalize the sudden effort and its rapid cessation, and the valves are usually cam valves controlled by a governor, so that mixture shall be admitted only at such intervals as the consumption of power demands. Instead of gas, the vapor of hydrocarbons (naphtha, petroleum,


Griffin Gas Engine.

etc.) can be used, mixed with air. This latter type of engines requires an air-compressing cylinder to carry the vapor in as a spray, with air at a pressure. The difficulties with such engines arise from the high temperature of the mixture, which makes lubrication difficult, from the deposit of soot and lamp-black in burners and passages, and from the odor, which cannot be prevented in service. They are not usually made of large size. Their great advantage is that no boiler of weight and bulk nor any skilled attendant is necessary, and expense begins and stops with the work. They are started without delay also.

**Gash Vein.** Form of ore deposit in which the mineral fills a shallow crevice, one that is frequently confined to a single stratum of rock and was evidently filled from above. The lead deposits of Wisconsin are frequently cited as examples of gash veins, though geologists are not all agreed on this point.

**Gaskell,** MRS. ELIZABETH CLEGHORN (STEVENSON), 1810–1865, m. 1832. English novelist, biographer of Charlotte Brontë, 1857. *Mary Barton*, 1848; *Ruth*, 1853; *Cranford*, 1853; *Sylvia's Lovers*, 1863; *Wives and Daughters*, 1865.—Her husband, WILLIAM, 1805–1884, Unitarian pastor at Manchester from 1828, wrote many hymns and several prose volumes.

**Gaskell,** WALTER HOLBROOK, M.D., F.R.S., b. 1847. English physiologist.

**Gasket.** 1. Rough rope of tow, used to pack a joint between two pieces of water-pipe before pouring in the melted lead. 2. Rope passed round a sail to bind it to the yard when furled.

**Gasoline.** Sp. gr. 0.67, bpt. 49° C. Mixture of hydrocarbons of low boiling point, obtained in the distillation of crude petroleum. It consists mainly of hexane and heptane, and is used for mixing with air to produce an illuminating gas in domestic gas machines and for fuel in stoves.

**Gasparin,** AGÉNOR ÉTIENNE, COMTE DE, 1810–1871. French Protestant, resident in Switzerland from 1848, writer on religion and politics. *Innocent III.*, 1859; *The Family*, 1865; *Luther and the Reformation*, 1873. His *Uprising of a Great People*, 1861, and *America before Europe*, 1862, won much gratitude in the U. S.—His wife, VALÉRIE BOISSIER, b. 1813, wrote on Marriage, the Poor of Paris, and other topics.

**Gass,** FRIEDRICH WILHELM JOHANN HEINRICH, D.D., 1813–1889. Prof. Greifswald 1847, Giesen 1861, Heidelberg 1868; historian of Dogmatics, 4 vols., 1854–67, and Ethics, 1881–87.

**Gassendi,** PIERRE, 1592–1655. French philosopher and physicist; prof. Paris 1645. He restored the atomic theory to speculation, but refused to accept atheism with it. *Syntagma Philosophiæ Epicuri*, 1649.

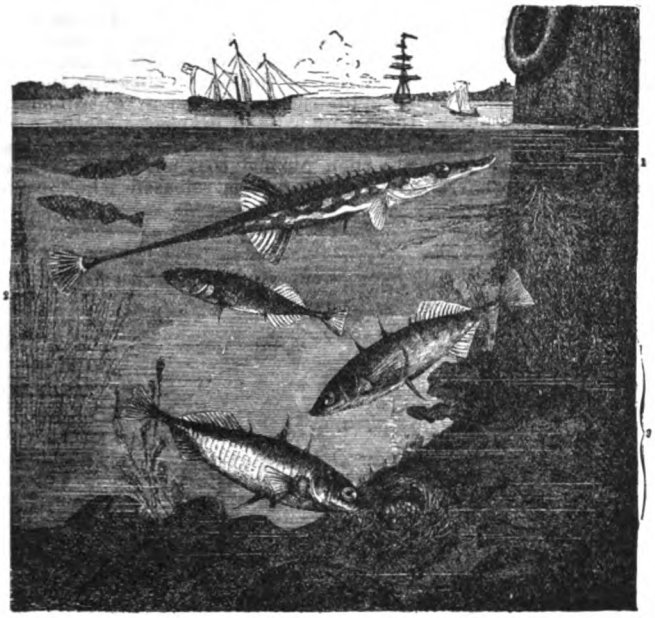
**Gastein.** Valley famous for its beautiful scenery and mineral springs, in Salzburg, Austria. Pop. ab. 4,000 and ab. 5,000 visitors.

**Gastein,** CONVENTION OF. Between Austria and Prussia Aug. 14, 1865, disposing of Schleswig, Holstein, and Lauenburg, lately taken from Denmark, Austria taking Holstein and Prussia the others.

**Gasteromycetes.** Order of Fungi embracing the puff-balls, earth-stars, and numerous smaller species. They are characterized by the presence of a permanent peridium or investing membrane.

**Gasteropoda.** See GASTROPODA.

**Gasterosteidæ.** Family of fishes including the Sticklebacks, with two, three or many spines, the number characterizing corresponding genera. The male builds a barrel-shaped nest, with two opposite apertures in line of the current. The



1. Many-Spined Stickleback. 2. Nine-Spined Stickleback. 3. Two-Spined Stickleback.

materials of which the nest are made are glued together by means of a secretion from special pre-anal glands. When the nest is finished several females successively lay their eggs in it, each layer being fertilized by the male. These fish are very destructive to the spawn of other species. See ACANTHOPTERI.

**Gas Thermometer.** Any form in which the variation in the volume or the tension of a fixed quantity of dry gas indicates the temperature of the latter. Hydrogen, oxygen, and carbonic acid gas have been employed hitherto.

**Gastræa Theory.** That of Haeckel, to the effect that all the *Metazoa* have descended from organisms which represented the GASTRULA (q.v.) in its simple form.

**Gastræidæ.** Hypothetical ancient family of Gastræas.

**Gastræum.** Belly, or venter, of an animal.

**Gastralgia.** Neuralgic pain in the stomach.

**Gastric Cavity.** One in which food is digested; a term usually applied to the cavities of the body in Cœlenterates, where no true digestive cavity exists as separated from a body cavity.

**Gastric Juice.** Clear acid liquid secreted by the stomach, containing free hydrochloric acid, pepsin, chlorides and phosphates, and having the property of converting proteids into peptones, soluble bodies which are readily absorbed.

**Gastric Mull.** Stomach of Crabs and Crayfishes. This has chitinous teeth on its inner walls, especially near its pyloric opening, where a valve and hairs form a straining apparatus. In front of this is a dorsal, central tooth, the urocardiac, doubly attached above to the prepyloric ossicle behind, and the urocardiac process in front. The latter in turn is attached to the cardiac plate, lying across the top of the stomach. On the sides are the large, ridged, lateral cardiac teeth borne by the zygocardiac ossicles, and in front of these are the pterocardiacs. The zygocardiacs articulate posteriorly and dorsally with the pyloric ossicle, which overarches the prepyloric and the urocardiac. There are also infero-lateral teeth lying ventrally, between the lateral cardiacs.

**Gastric Ulcer.** Ulceration of the stomach, usually marked by indigestion, pain limited to one spot and increased by pressure, and vomiting of blood. It is usually fatal, though if recognized early it may be cured by astringents and low diet.

**Gastritis.** Inflammation of the mucous membrane of the stomach, with loss of appetite, coated tongue, nausea, vomiting, pain, and fever; in chronic cases indigestion, distress after eating, and emaciation are the most marked symptoms. Abstinence from indigestible food, bitter tonics, mineral acids and pepsin usually effect a cure.

**Gastrocœliac Cavity.** Body cavity that also functions as the digestive cavity; also called a gastrovascular cavity, because it also functions as a circulatory system, as in the gastro-vascular canals of Jellyfish.

**Gastrodela.** Order of Rotifers, having a sac-like body and no shell nor intestines.

**Gastro-Duodenitis.** Simultaneous inflammation of the stomach and duodenum, indicated by loss of appetite, nausea, coated tongue, constipation and jaundice. Abstinence from food, and laxatives usually suffice to effect a cure.

**Gastronomy.** Science of delicate eating: it relates to the quality of food, gourmandism to the quantity. The elegant discriminations of the cultivated palate were first inculcated by Epicurus, and the enthusiasm of his followers among the Romans is attested by the Orchian, Fannian, and Didian laws, which heavily mulcted the hosts who gave and the guests who partook of costly feasts. The fondness for exotic delicacies, however, grew too strong for the law, under the examples of exquisite refinements set by Apicius, who committed suicide rather than submit to plain fare, Hortensius, who would rather give you an estate than a carp from his fish ponds, and Lucullus, proverbial for luxurious delicacies. Samian peacocks, Phrygian land-rails, snipes, and woodcocks, Melian cranes, Ambracian kids, Chalcedonian tunny-fish, Tartessian hippocras, cod of Pessinus, Tarentum oysters, Chian crabs, the Rhodian helops, Cilician char, Tatian nuts, Egyptian dates, and Spanish chestnuts were highly prized. Dinner began with plover's eggs, and ended with apples. During the Middle Ages gastronomy languished, except in a few abbeys, gross feeding being the rule. Swans, puppies, porpoise and whale were dainties. Later, Italy and France were the pioneers of gastronomic refinements, and in the 18th century England produced many famous epicures. See COOKERY.

**Gastropacha.** Genus of bombycid moth having a thick body, short antennæ, and dentate wings. Found mostly in Asia, rarely in America, and a few species in Europe. They fly

Gastropacha.

*a*, male; *b*, female, laying eggs, *c*; *d*, larva (caterpillar); *e*, cocoon; *Calosoma* (beetle) feeding on larva; *g*, larva of *Calosoma*; *h*, *Ichneumon*, ovipositing in caterpillar; *i*, *Microgaster*, emerged from cocoons, parasitic on caterpillar.

mostly by night and closely resemble the foliage among which they live. The caterpillars are dusky-gray or brown. Larvæ are 16-footed, highly colored, and live exposed on plants.

**Gastropoda,** or GASTEROPODA. Class of *Mollusca*, including those having a distinct head (in many forms bears tentacles), a ventral foot, and an undivided mantle, which usually secretes a cup-shaped or spirally twisted shell. The group includes the orders *Prosobranchiata*, *Heteropoda*, *Pulmonata*, and *Opisthobranchiata*. These have been variously grouped, either as *Isopleura* and *Anisopleura*, or as *Branchifera* and *Pulmonifera*.

**Gastrostomy.** Establishment of an opening into the stomach through the abdominal wall; in some cases a silver tube with flanged ends is inserted and allowed to remain. It is done when œsophagus is obstructed and in animals to obtain gastric juice.

**Gastrotomy.** Act of cutting into the abdomen; LAPAROTOMY (q.v.) is the term more commonly used.

**Gastrotricha.** See NEMATORHYNCHA.

**Gastrotrocha.** Annelid larva with transverse bands of cilia on its ventral surface.

**Gastrovascular Canals.** Tubes which radiate from the stomach in Cœlenterates. These usually pass, with or without branching, to a circular ring canal at the periphery of the medusoid polyps, and serve to carry nutriment to various parts of the animal, thus taking the place of a blood system.

**Gastrula.** Stage in development which follows the blastula, when the embryo or the blastoderm becomes two-layered. The typical gastrula may be illustrated by a hollow rubber ball which has been pushed in on one side so as to make a double walled cup. Then the lips of such a cup must be conceived as growing up and contracting so as to leave a small aperture, the Gastrula Mouth, at one pole of the resulting double-walled sphere. See GASTRÆA THEORY, GASTRULATION, and DEVELOPMENT.

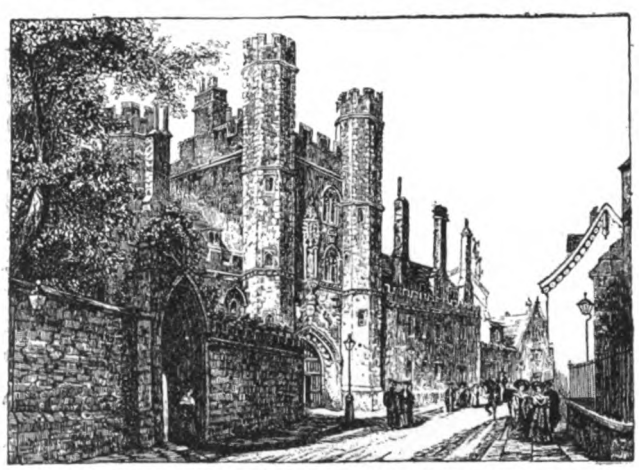
**Gastrulation.** Process of the formation of the gastrula stage, which may take place by delamination or invagination. The latter again may be EMBOLE or EPIBOLE (q.v.). In many Cœlenterates there are more primitive methods of gastrula formation known as immigration, in which the hypoblast is derived from cells that have wandered individually from the blastula wall.

**Gatchina.** Russian town 30 m. s.w. of St. Petersburg, containing a palace and gardens, the favorite residence of the Czars Paul I. and Alexander III.

**Gate.** 1. Door which either swings on hinges or slides in grooves so as to regulate or shut off the amount of water delivered through a conduit. 2. In mining, underground opening used as a passageway for air, water, or tramming.

**Gate Chamber.** Masonry chamber at the side of a reservoir, containing the valves or gates by which the flow of water into the pipes is regulated.

**Gatehouse,** or GATEWAY. In Mediæval architecture this is always a most important feature. Castles, abbeys, colleges,



Entrance Gateway, St. John's College, Cambridge, Eng.

city walls, all had strong gateways portcullised, barred, pierced above, and frequently flanked with towers. Many of the old city gates still remain.

**Gates,** HORATIO, 1728–1806. Major under Braddock 1755; General in the American army 1775. He rose to factitious greatness by receiving Burgoyne's surrender at Saratoga Oct. 1777, an event due chiefly to Gen. Schuyler; intrigued against Washington; was given command in the South 1780, and totally defeated at Camden, S. C., Aug. 16, 1780.

**Gates,** MERRILL EDWARDS, LL.D., b. 1848. Pres. Rutger's Coll., N. J., 1882–90; Pres. Amherst since 1890.

**Gateshead.** Borough of England, on the Tyne, opposite Newcastle. It has large steel and iron factories and shipbuilding. Pop., 1891, 85,709.

**Gath.** Philistine town on the border of Judah; birthplace of Goliath; taken by David.

**Gatien-Arnould,** ADOLPHE FELIX, 1800–1886 French writer on philosophy and on Provençal tongues; Mayor of Toulouse 1848; prof. there 1864–73; biographer of V. Cousin 1867.

**Gatling,** RICHARD JORDAN, M.D., b. 1818 in N. C. Inventor of machines for sowing cotton and dressing hemp, of a screw similar to Ericsson's, and of the gun named from him.

**Gatling Gun.** Machine gun invented 1862. It has been repeatedly improved and the rapidity of its fire greatly increased, until now it can deliver 3,000 bullets per minute. It now consists of 10 rifle barrels of the same caliber as the infantry musket, grouped cylindrically around a central shaft about which they are turned by a hand crank. Metallic cartridges are dropped through a hopper into the carrier by a feeding device; they are then pushed to their places at the breech of the barrel. The firing pin is released when each

Gatling Gun in action.

barrel comes to its proper position, the projectile discharged, the empty cartridge case removed and a new cartridge inserted in succession as the barrel is rotated. All the operations are automatic, being controlled by the motion communicated to the shaft by the hand crank. An automatic lateral motion can also be given to the gun, so as to cause its plane of fire to coincide with a desired sector. Its special use is for the defense of defiles, ditches, or the covering of a definite direction against an enemy approaching in mass or in line. It cannot withstand light artillery. It has been adopted into most military and naval services.

**Gatty,** ALFRED, D.D., b. 1813. English author.—His wife, MARGARET (SCOTT), 1809–1873, wrote *Parables from Nature*, 1855–71, with other books for children, and ed. *Aunt Judy's Magazine* from 1866.—Their daughter, JULIANA HORATIO, 1842–1885, became MRS. ALEXANDER EWING (q.v.) 1867.

**Gauchos.** Herdsmen of Argentina and Uruguay, usually of mixed blood; good riders and fighters, ready for revolution or brigandage.

**Gaudeamus.** German students' song 1776; since improved; based on a Latin hymn of 1267.

**Gauden,** JOHN, D.D., 1605–1662. Dean of Bocking, Essex, 1641; Bp. of Exeter 1660, and Worcester 1662; supposed author of *Eikon Basilike*, 1649.

**Gaudentius.** Name assumed by bishops in the early Christian Church. Gaudentius of Brescia, ab.360–ab.410, was the most famous.

**Gaudin,** JEAN FRANÇOIS GOTTLIEB PHILIPPE, 1766–1833. Swiss botanist. *Agrostologia Helvetica*, 1811; *Flora Helvetica*, 1828–33; *Synopsis Floræ Helveticæ*, 1836.

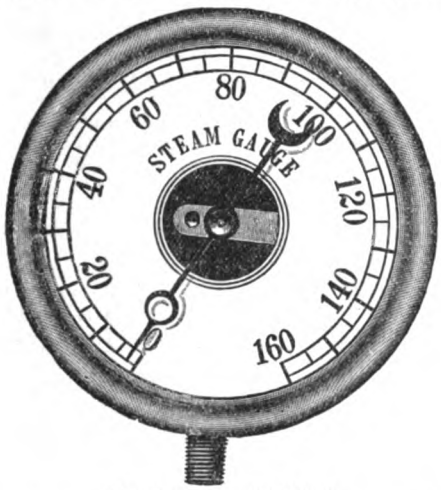
**Gaudry,** ALBERT, b. 1827. French geologist. *The Fossil Animals and Geology of Attica*, 1862–67; *The Contemporaneity of the Human Species with diverse Animal Species now extinct*, 1861; *The Geology of the Isle of Cyprus*, 1862.

**Gaugamela.** In Assyria; scene of Alexander's victory over Darius 331 B.C., commonly called the Battle of Arbela.

**Gauge,** BIRMINGHAM. Series of arbitrary numbers for designating the diameters of rods and wire and the thickness of plates, No. 1 denoting 0.3 inches, No. 2 0.284 inches, up to No. 36, which denotes 0.004 inches.

**Gauge,** MEASURING. Instruments to secure precision in size for manufactured articles. Usually they are pieces of steel hardened, or of wrought-iron case-hardened, of the required shape for the dimension which they are to determine, and carefully ground to exact length, diameter, or caliber, as the case may require. The dimension is tested on a comparator to prove its agreement with a standard unit. There are also limit gauges which are a given number of thousandths of an inch larger and smaller than the standards; the size of the measured piece must be smaller than the superior limit and greater than the inferior. There are also thread gauges for screws. Gauges are used also to set CALIPERS (q.v.) by, instead of depending on the ordinary machinists' scales for work at lathes, etc.

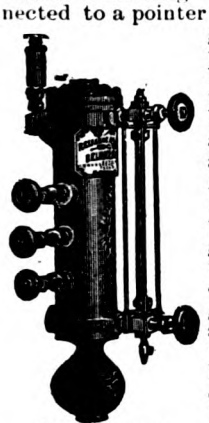
**Gauge,** STEAM. Manometers to determine the pressure of a vapor or gas inside a closed vessel. Simplest and for light pressures is a mercury column in a U-tube, open or closed at the end not connected to the closed vessel. These are not adapted for higher pressures. Here either a diaphragm or a Bourdon gauge will be used. A diaphragm gauge has a corrugated plate of elastic metal, and the vapor pressure on one




Bourdon's Pressure Gauge.

side tends to deflect it. The amount of deflection is indicated by a pointer moving over a graduated arc, and connected by multiplying leverage to the diaphragm. The Bourdon gauge uses a tube of flattened elliptical section, the flattened tube being curved to an arc of a circle. Pressure inside this spring tube tends to restore it to a circular section and in so doing to straighten it. The amount of straightening is multiplied and indicated as before by a pointer traversing a graduated arc.

**Gauge,** WATER. Device to indicate the height of fluid inside of containing vessels. Simple floats are much used, connected to a pointer traversing a scale. For steam boilers the glass gauge is nearly universal, a strong tube being connected to the shell at the bottom below the lowest water-line and at the top above the highest. The water can be seen in the glass tube to be at the level at which it stands inside the shell. Fixtures at the top and bottom of the glass tube make it convenient to replace the tube when necessary, and in these fixtures may be placed automatic valves to close should the glass break in use. Closure or stoppage of the lower connection to the tube is one serious defect of this type. Besides the tube, gauge or try-cocks are used. Three or four small cocks are placed one over the other, with the central one at the normal water-level, so that when one is opened it will draw off a sample of what is inside the boiler at that level. This indication is infallible, and these cocks are universal as a water gauge. Other water gauges are in the form of alarms. In one of these a tube is let into the top of a boiler below the proper water line, on the outer end is a whistle. When the water falls below the end of the pipe the steam sounds the whistle.



Water Gauge.

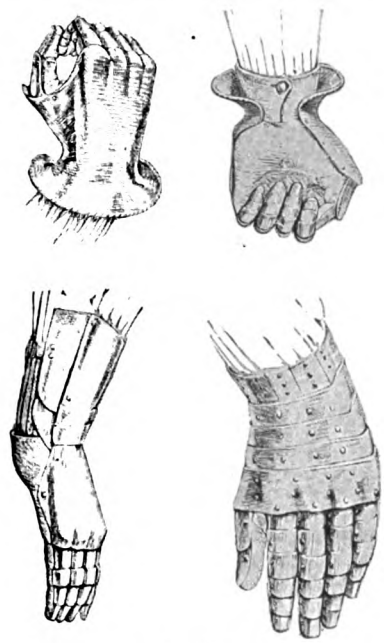
**Gauging of Streams.** Observations and computations made to determine the discharge and mean velocity of a stream. The usual method is to take soundings at two parallel cross-sections from which their areas can be found, and to observe by means of floats the velocities at different parts of the stream.

**Gaul,** GILBERT WILLIAM, b. 1855. American painter, whose subjects are largely from the Civil War.

**Gauls.** Called Celtæ and Galatæ by Greeks; originally nomads from Asia, settled in Spain, France, n. Italy, and the British Isles. They sacked and burned Rome 390 B.C., overran n. Greece 280 B.C., aided and were subjugated by Cæsar after 8 campaigns in 50 B.C. After the repulse from Delphi 279 B.C. a mass of them crossed the Hellespont and overran most of Asia Minor, but were checked by Attalus I. 230 B.C. and confined within Galatia. They contended with Rome in all parts of the earth, and by Rome alone were vanquished.

**Gault.** Stiff, blue clay, sometimes calcareous or sandy, with layers of phosphatic nodules and green sand, marking the boundary line between the Upper and Lower Cretaceous rocks; from 100 to 200 ft. thick. It is abundant in fossils.

**Gauntlet.** Leather glove covered with plates corresponding to the rest of the armor. The earliest form is found without separate fingers. Many Italian examples are beautifully



Gauntlet.

chased. Armed with sharp spikes of steel on the knuckles, they were known as Gads. In challenging, the gauntlet was always cast down as sign of defiance, to be picked up if accepted.

**Gauss.** Unit intensity of force in a magnetic field; equal to the force exerted by a unit magnetic pole at the distance of one centimeter. The name, that of Prof. C. F. Gauss, was suggested by Lord Kelvin.

**Gauss,** CARL FRIEDRICH, 1777-1855. Director of the Göttingen observatory from 1807. Among his many important contributions to science, perhaps the most prominent are the *Theoria Motus Corporum Cœlestium*, 1809, and the method of least squares. *Disquisitiones Arithmeticæ*, 1801; *Circa Superficies Curvas*, 1827; *Geodasie*, 1843–46; *Works*, 7 vols., 1863–71.

**Gaussen,** FRANÇOIS SAMUEL ROBERT LOUIS, 1790–1863. Founder, with Merle d'Aubigné, of the Evangelical Society and its theological seminary at Geneva; prof. there from 1836. His *Theopneustia*, 1840, defends verbal inspiration. *Daniel*, 3 vols., 1839–49; *Canon of Holy Scriptures*, 1860.

**Gauss Equations.** Group involving functions of the elements of spherical triangles and used for their solution.

$$\text{Sin } \tfrac{1}{2}(A+B)=\frac{\cos \tfrac{1}{2}(a-b)}{\cos \tfrac{1}{2}c} \cos \tfrac{1}{2}C$$

$$\text{Sin } \tfrac{1}{2}(A-B)=\frac{\sin \tfrac{1}{2}(a-b)}{\sin \tfrac{1}{2}c} \cos \tfrac{1}{2}C$$

$$\text{Cos } \tfrac{1}{2}(A+B)=\frac{\cos \tfrac{1}{2}(a+b)}{\cos \tfrac{1}{2}c} \sin \tfrac{1}{2}C$$

$$\text{Cos } \tfrac{1}{2}(A-B)=\frac{\sin \tfrac{1}{2}(a+b)}{\sin \tfrac{1}{2}c} \sin \tfrac{1}{2}C$$

**Gauss' Theorem.** If any closed surface S, drawn in a field of force, be divided up into a large number of surface elements, and if each one of these elements be multiplied by the component in the direction of the interior normal of the force of attraction at a point of the element, and if these products be added together, the limit of the sum thus obtained, as the elements are made smaller and smaller, is called the surface integral of normal attraction over S. This theorem asserts that the surface integral of normal attraction over any closed surface whatever is equal to $4\pi$ times the quantity of matter it incloses; or $\int N ds = \int D_n V ds = 4\pi M$; where N is the normal component of the force, and V the potential function at the point. Clearly, if all the attracting matter is without the closed surface, the integral is equal to zero.

**Gautama.** See BUDDHA.

**Gautier,** JEAN ALFRED, 1793–1881. Director of the observatory at Geneva; early discoverer of the connection between sun spots and terrestrial magnetism.

**Gautier,** THÉOPHILE, 1811–1872. French poet, novelist, critic, and traveler. *Mlle. de Maupin*, 1835; *Comédie de Mort*, 1838; *Les grotesques*, 1844; *L'Histoire de l'Art Dramatique en France*, 6 vols., 1859; *Histoire du Romantisme*, 1874.

**Gauze.** Light silk fabric, probably named from Gaza in Palestine; now made chiefly in France and Switzerland. Antiseptic gauze is much used in surgery.

**Gavarni,** PAUL (SULPICE GUILLAUME CHEVALIER), 1801–1866. French caricaturist; illustrator of Balzac, Sue, and Hoffmann. 6 vols. of his drawings were pub. 1845–50.

**Gavarnie.** Frontier village in the Pyrenees between France and Spain. It is situated on the Gave de Pau, which ab. 3 m. to the southward falls 1,385 ft. into the famous Cirque of G.

**Gavazzi,** ALESSANDRO, 1809–1889. Italian liberal; prof. at Naples 1829–40; chaplain of the Republican army 1848, and of the Garibaldians 1860; founder of the Free Ch. of Italy 1870, and prof. in its theol. sem. at Rome 1875. His eloquence was known in England and the U. S. 1849–51 and 1881. *Memoirs*, 1851; *Last Four Popes*, 1859; *No Union with Rome*, 1871.

**Gavelkind.** Tenure by which land descended equally to the sons; if no sons, equally to the daughters; if no issue, equally to the brothers.

**Gaviæ.** See LONGIPENNES.

**Gavials.** Family of *Crocodilia* characterized by having a long, narrow snout, swollen at the end, with the lower teeth set obliquely so as to fit into notches in the sides of the upper jaw when the mouth is shut. The plates on the head are continuous with those on the back; the young have broad snouts as in Crocodiles. They abound in Asia and Australia. Being considered sacred in India, they are so numerous as to be a menace to human life in some places. A length of 20 feet is attained. There are 26 or more equal teeth in each jaw. See PROCŒLIA.

Gavial (*Gavialis gangeticus*).

**Gavotte.** Lively dance in common time, beginning on the third beat of the measure; much admired in 17th and 18th centuries. Its origin has been traced to the mountain people of the Dauphiné, called Gavots.

**Gay,** CLAUDE, 1800–1863. French naturalist, in Chili 1828–43. *Historia Fisica y Politica de Chile*, 24 vols., 1843–51.

**Gay,** EDWARD, b. 1837. Irish-American painter.

**Gay,** JOHN, 1688–1732. English poet and dramatist. *Shepherd's Week*, 1714; *Trivia*, 1715; *Fables*, 1727; *Beggar's Opera*, 1727.

**Gay,** MME. MARIE FRANÇOISE SOPHIE, 1776–1852. French dramatist and novelist. *Anatole*, 1815; *Ellénore*, 1846.

**Gaya.** City of British India, on the Phalga, a branch of the Ganges. It has associations sacred to Buddhists: the 45 shrines in or near it are the resort of many pilgrims. Pop., 1891, 79,920.

**Gayant,** SIRE DE. Mythical champion or deliverer of Douai, France. In his fête, dating from 1479, gigantic effigies of himself and family (added 1665) are carried in procession July 8–11.

**Gayarré,** CHARLES ÉTIENNE ARTHUR, 1805–1895. American author of French descent, best known by his works on the history of Louisiana, 1847–54, collected in 3 vols. 1866. *Philip II. of Spain*, 1866. He also wrote plays and novels. He held several offices in La., and was its Sec. of State 1847–54.

**Gay-Lussac,** JOSEPH LOUIS, 1778–1850. French chemist and physicist; prof. at Paris École Polytechnique 1809, and at Jardin des Plantes 1832. Author of a vast number of monographs.

**Gay-Lussac,** LAW OF. If a given volume of a gas be not allowed to expand, that for a given increase of temperature t the final pressure $p_t$ would be to the initial pressure $p_0$ in a relation

$$p_t = p_0(1+\alpha t)$$

$\alpha$ being a coefficient to be ascertained for each gas. Similarly, if the pressure be kept constant,

$$v_t = v_0(1+\alpha t)$$

will show the relation of the final volume $v_t$ to the initial volume $v_0$. Value for $\alpha$ for nearly all gases is $\alpha = 0.00365$ for a Cent. degree, and 0.002035 for a Fahr. degree. See MARIOTTE'S LAW, BOYLE'S LAW, and CHARLES' LAW.

**Gay-Wings.** See WINTERGREEN, FLOWERING.

**Gaza.** Philistine city of s.w. Palestine, taken by Alexander 333 B.C., by the Saracens 634, and by the French 1797. Pop. 16,000.

**Gaza,** THEODORUS, ab. 1398–1478. Scholar of Thessalonica, in Italy from ab. 1444; teacher at Ferrara, Rome, and Naples; translator of Aristotle and other Greek authors. His Greek grammar, 1495, was in use 300 years.

**Gazelle.** Genus embracing over 20 species of small Antelopes of the N. African deserts. The general color is nearly that of the desert, but pure white below. The horns, less than a foot long, are black, the ears and lustrous eyes are large, the hair like satin, the form very beautiful. In speed they are unexcelled. The hide is used for making water-skins, after four days' tanning. The Gazelle of S. Africa is the SPRINGBOK (q.v.).

Gazelles.

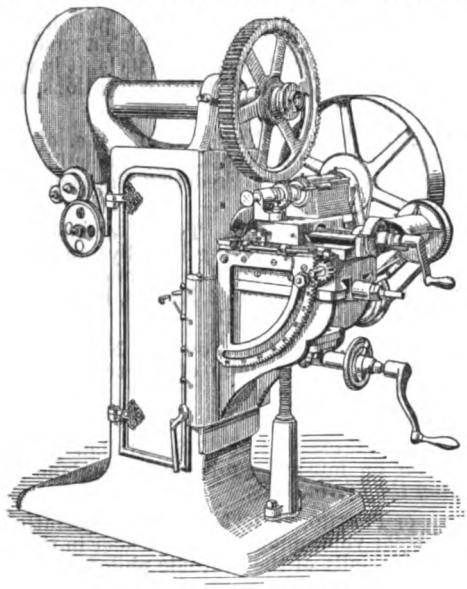
**Gazette.** Newspaper owned by government, containing official announcements; *e.g.*, the *London Gazette*, started 1665.

**Gazetteer.** Dictionary of geography, whether universal, national, or local. That of Ferrarius appeared in Paris 1670, that of Echard in London 1703–4.

**Gazetting.** Official publication of a civil appointment in the British Service, or the bestowal of a commission in the army, militia, or volunteers.

**Geanticline.** Large ANTICLINE (q.v.) across a broad region inclosing subordinate folds.

**Gear-Cutter.** Machine for the manufacture of cog-wheels or toothed gear by the process of cutting the exact profiles of the teeth with a pitch which is exactly an aliquot part of the circumference of the wheel. There are two types. In either a cylinder of the proper diameter for the outside tips of the teeth is mounted upon a mandrel. Then for the rotating cutter type a cutter having the proper profile is fed against the rim of the wheel, and cuts out the space between two teeth, and of the right depth. Then the cutter is withdrawn and the mandrel is rotated through the required angle, for the next traverse of the rotating cutter. This angular adjustment is effected either by an index plate or cylinder secured to the mandrel or by tangent screw on the edge of a worm wheel similarly secured to the mandrel. The index plate has a number of concentric circles on it, each circle having a certain number of holes drilled on it, and the holes in each circle being equidistant. A pin attached to the frame can fit these holes and prevent the mandrel from turning, while securing at the same time that the blank has revolved through such a fraction of an entire turn as has for a denominator the entire number of holes in that circle,



Automatic Gear-Cutting Machine.

and for a numerator 1, or any whole number. In the tangent screw plan, a crank or hand-wheel is connected to the screw by a train of change-wheels. The hand-wheel has springs to lock it at the end of a revolution, and the train of change-wheels can be computed to produce any desired angular motion of the index-wheel for one or more complete turns of the hand-wheel. For the reciprocating gear-cutters of the second class, the tool is borne on a bar or slide, which rests against a template or former, carefully shaped. The cutting-point therefore reproduces the former by a number of reciprocations in the space. Improved gear-cutters of either class are made automatic, so that at the end of the cutting of one space secondary feed-gearing is engaged with the index-wheel gear, and the latter receives the number of turns necessary to give the proper spacing of the teeth and is then locked for the next traverse of the tool. The term gear-cutter is also used for the rotating tool which does the cutting. These are serrated milling-tools, carefully profiled to the proper shape by machinery which reproduces the assigned form, and one form of relieved cutter makes it possible to grind the face of the cutting edges without vitiating the profile.

**Gear Wheels.** Toothed wheels. The usual forms are spur-wheels, where the shafts are parallel; bevel-wheels, where the shafts intersect; skew-bevel, where the shafts are not parallel and do not intersect; and screw-gearing, where one of the wheels is a screw. A rack is a wheel with an infinite radius, so that the pitch surface is a plane. A pinion is a smaller wheel of a pair or train. A shrouded pinion is one in which the teeth are strengthened by being covered in at the ends up to the pitch line. Miter gears are bevel wheels where the two cones are equal, and the shafts at right angles. Helical gear are wheels where the teeth elements are parts of screws. Each tooth is either on one helix as an axis, or else one right and one left helix meet in the middle of the face. This latter form gives the strength due to large pitch, and the smoothness due to large numbers of teeth. For the tooth profiles, epi- and hypocycloids and involutes are the usual curves. A crown-wheel is

Elliptic Gearing, Bevel Gears with Planoid Teeth, and Spiral Gearing.

one which has teeth on the side, with their axes normal to the shaft. Internal gear is the case in which one wheel has teeth on the inside of a hollow cylinder. See ANNULAR WHEEL and LANTERN GEAR.

**Geary,** JOHN WHITE, 1819–1873. Colonel 1847, and Commander of the City of Mexico; first Mayor of San Francisco 1850; Gov. of Kansas 1856–57; Gen. U. S. Vols. 1862–65; Gov. of Pa. 1867–73.

**Geber,** or DSCHABIR. Arab who taught alchemy at Medina ab. 750. His descriptions of apparatus employed in various chemical operations are clear and intelligible. See ALCHEMY.

**Gebirah.** In Israel, the king's mother, Sultana Valide, scarcely inferior in authority to the king. One Athaliah, on her son's death, succeeded in nearly exterminating the royal race, and seizing the throne for six years; another was deposed for idolatry.

**Gebirs.** See GUEBERS.

**Gecko.** See CRASSILINGUIA.

**Ged,** WILLIAM, d. 1749. Scottish goldsmith, inventor of stereotyping.

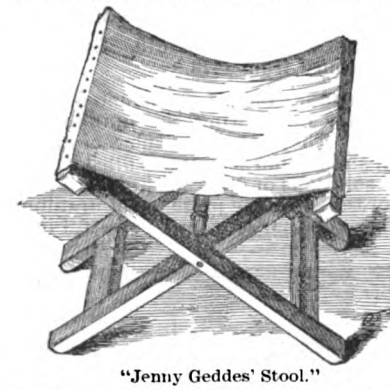
**Gedaliah.** Jew left by Nebuchadnezzar as Viceroy in Palestine after the fall of Jerusalem; murdered by Ishmael.

**Geddes,** ALEXANDER, LL.D., 1737–1802. Scottish biblical critic; R. C. priest in Banffshire 1769–79, then deposed and resident in London. His tr. of O. T. historical books, 1792–93, and *Remarks* thereon, 1800, were liberal beyond the verge of rationalism.

**Geddes,** ANDREW, A.R.A., 1789–1844. Scottish painter.

**Geddes,** JAMES, 1763–1838. American civil engineer, who made the first surveys for the Erie Canal.

**Geddes,** JANET. Historic or legendary Scottish market-woman who, on July 23, 1637, threw her stool at the dean's



"Jenny Geddes' Stool."

head in St. Giles' Ch., Edinburgh, as he was reading the Episcopal service. The scene which ensued had momentous results on the religion and politics of Scotland.

**Geelong.** Port in Victoria, Australia, 40 m. s.w. of Mel-

Geelong, Victoria.

bourne. It is situated at the head of a fine harbor amid beautiful scenery and has an extensive wool trade. Pop., 1891, 20,682.

**Geese.** See ANSERINÆ.

**Geffrard,** FABRE, 1806–1878. Pres. of Haiti 1860–67.

**Geffroy,** MATHIEU AUGUSTE, 1820–1895. Prof. Paris; historian of Scandinavia 1851–67.

**Gegenbaur,** KARL, b. 1826. Prof. Heidelberg since 1873; leading writer on Comparative Anatomy.

**Gefle.** Swedish port on the Gulf of Bothnia standing third in commercial importance. It has shipbuilding and exports of iron, timber, and tar. Pop., 1894, 23,500.

**Gehenna.** Valley of Hinnom; defile of Jerusalem, in which, it is said, great fires were kept burning to consume the refuse of the city.

**Gehlenite.** Calcium aluminium silicate found at Mount Monzoni, Austria; also observed as an artificial product in furnace slags.

**Gehydrophila.** See BASOMMATOPHORA.

**Geibel,** EMANUEL, 1815–1884. German poet, prof. Munich 1852–68; tr. Greek and Spanish poems 1840–43; author of two tragedies, *Brunehilde*, 1857, and *Sophonisbe*, 1868. His lyrics, 1840–64, are among the most popular in Germany.

**Geiger,** ABRAHAM, 1810–1874. German rabbi; ed. *Jüdische Zeitschrift*; prolific writer. *Das Judenthum und seine Geschichte*, 1864–65.—His relative, LAZARUS, 1829–1870, wrote on speech as necessary to thought. *Sprache und Vernunst*, 1868–72.

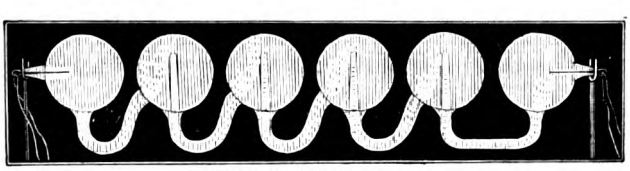
**Geijer,** ERIK GUSTAF, 1783–1847. Swedish poet and historian; ed., with A. Afzelius, 3 vols. of national songs, 1814–16; prof. Upsala 1815–46. His chief work is *History of the Swedish People*, 3 vols., 1832–36. *Annals*, 1825; *Life of Charles XIV.*, 1844.

**Geikie,** SIR ARCHIBALD, LL.D., F.R.S., b. 1835. Prof. Edinburgh 1870–81; connected with the Geological Survey of the United Kingdom from 1855, and its Director-gen. 1881; knighted 1891; Pres. British Assoc. 1892. *Glacial Drift of Scotland*, 1863; *Geology*, 1873–82.—His brother, JAMES, LL.D., D.C.L., F.R.S., b. 1839, was on the Survey 1861–82, and then became prof. Univ. Edinburgh. *Great Ice Age*, 1874; *Prehistoric Europe*, 1881; *Outlines of Geology*, 1886. His *Evolution of Climate* and other works are on the borderland of Geology and Meteorology.

**Geikie,** JOHN CUNNINGHAM, D.D., LL.D., b. 1824 in Edinburgh. Popular author. Presb. till 1876, then Anglican. *Entering on Life*, 1874; *Promises*, 1875; *English Reformation*, 1875; *Life and Words of Christ*, 1876; *O. T. Characters*, 1877; *Hours with the Bible*, 6 vols., 1880–85; *Holy Land*, 1887.

**Geiler,** JOHANNES, D.D., 1445–1510. Swiss priest, famous preacher at Strassburg from 1478.

**Geissler's Tubes.** Device constructed by H. Geissler of Bonn (1814–1879) for illustrating the luminous effects of the electric discharge. They consist of tubes of glass worked into various fanciful shapes and sometimes filled with rarefied gases and fluorescent solutions of different kinds. The glass itself is often made fluorescent by the presence of uranium or sulphate of quinine, and the discharge from a powerful induction coil is



Geissler's Tubes.

capable of producing various brilliant effects. Prof. Plücker of Bonn contrived a set of tubes containing the various gases, but especially adapted for spectroscope work. The middle portion of the tube is of capillary bore, and the discharge through this narrow channel renders the gas far more luminous than in the wider parts of the tube.

**Geitonogamy.** Fertilization of flowers by pollen from other flowers borne on the same plant.

**Gela.** Greek city of s. Sicily, founded 690 B. C. from Rhodes and Crete. It founded Agrigentum 582, and was depopulated ab. 280 B. C.

**Gelasius I.** Pope 492–496. He claimed to be above all other bishops.—II. Giovanni of Gaeta, Pope 1118–19.

**Gelatination.** Mucilaginous modification of the cell walls of plants. It is especially prevalent in Algæ, and occurs in many seeds.

**Gelatine.** Substance obtained from gelatinous tissues of animals; when impure it is glue. It is soluble in acetic and sulphuric acids and in hot water, which forms a jelly on cooling. It is insoluble in alcohol and ether. Tannic acid, chrome alum and mercuric chloride precipitate it. Leather is a compound of the gelatine of hides and tannic acid of bark. It is a valuable constituent of animal foods, but by itself is insufficient to maintain life. See GLUE.

**Gelatine,** BLASTING. Mixtures of nitroglycerine and gun-cotton up to 8 per cent of the latter. High explosive. Invented by Alfred Nobel 1879. See FORCITE.

**Gelatine Dynamite.** Mixture of 65 parts blasting gelatine, containing 2.5 per cent gun-cotton, and 35 parts of a mixture of 75 per cent potassium nitrate, 24 per cent wood meal, and 1 per cent sodium carbonate.

**Gelder,** AART DE, 1645–1727. Dutch painter, follower of Rembrandt. His *Admiral* in the N. Y. Metropolitan Museum is a fine example.

**Gelée,** CLAUDE. See CLAUDE LORRAINE.

**Gell,** SIR WILLIAM, 1777–1836. English antiquarian, writer on Troy, Rome, and Greece. His chief work is *Pompeii*, 4 vols., 1817–32.

**Gellert,** CHRISTIAN FURCHTEGOTT, 1715–1769. German poet, noted chiefly for his fables, 1746–48, and hymns, 1757; prof. at Leipzig from 1751. *Works*, 10 vols., 1769–74.

**Gellius,** AULUS, 2d century. Roman philologist, whose work, *Noctes Atticæ*, is in 20 books, of which a small portion is lost. While faulty in arrangement and style, it is valuable on account of its vast store of anecdotes, quotations, and statements, both literary and historical.

**Gelnhausen.** Town in Prussia 23 m. e.n.e. of Frankfort. Its fort on an island in the river Kinzig was built with stones from the ruins of the Emperor Frederick Barbarossa's Palace. Pop., 1891, 4,000.

**Gelon,** or GELO, d. 478 B.C. Tyrant of Gela 491, and of Syracuse 485; soon practically King of Sicily; an able ruler and beneficent despot, greatly honored in life and after death. He refused to aid the Greeks against Xerxes, but overthrew the Carthaginians at Himera 480 B. C.

**Gembloux,** or GEMBLOURS. Town in Namur, in Belgium; scene of the victory of Don John of Austria over the Dutch 1578. Pop. 4,193.

**Gemini.** See ZODIAC.

**Geminiani,** FRANCESCO, 1680–1762. Italian violinist, composer and writer on musical subjects; in England from 1714. *Art of Playing the Violin*, 1740.

**Gemistus,** or PLETHO, ab.1390–ab.1490. Byzantine official, in Italy from 1445; voluminous writer; leader in the revival of learning, and especially of the Platonic philosophy.

**Gemitores.** See COLUMBINÆ.

**Gemma.** See BUD.

**Gemmation.** Propagative process in the yeast-plant and other minute organisms, in which a new cell grows out from the side of an older one; known also as Budding.

**Gemmiparous.** Reproducing by budding.

**Gemmules.** In Botany, formative grains in the protoplasm of plant cells.—In Biology, spores, or cells, capable of reproducing the parent, though they are not sexual cells, nor very different from the other tissue cells. In Darwin's terminology, minute, hypothetical spores, given off by the cells of the tissues of the body and collected by reproductive cells. They can reproduce only the kind of cell they came from. See PANGENESIS and PERIGENESIS.

**Gem Sand.** Shan article of merchandise from the neighborhood of Ava, Burmah. It contains particles of all precious stones, but principally garnet, beryl, and 75 per cent spinel.

**Gems,** ENGRAVED. The cutting of designs on precious stones for use as signets is of high antiquity. In early Chaldea the roller-shaped form or cylinder was used for this purpose. The cone-shaped form appears with the cylinder in Assyrian art. The cylinder was also known to the older art of Egypt. The oval stones set in finger-rings first appear in general use in the art of the Mycenæ culture ab. 1400 B.C., but are undoubtedly derived from Oriental countries. They were very common in Syrian and Phœnician use as early as the 9th century B.C., and it is probably only the deficiency of dated examples which prevents our knowing them in much higher antiquity. The signet gem is very common in Cypriotic art, but appears in highest excellence with the Greeks of the mother country and with the Etruscans as influenced by Greek art, in the 5th and 4th centuries B.C. Down to the close of classic antiquity the

style and quality of gem engraving follow the general laws holding for the periods of perfection and decline in other arts. It was revived by the Italian Renaissance, whose best works can only with difficulty be distinguished from the antique. The great perfection of the ancient designs lies in the tact of arrangement by which the forms and figures are controlled, the

Marriage of Cupid and Psyche (Gem engraved by Tryphon).

relations to the bounding frame or outline and the balance and simplicity of the composition. In the technical perfection of cutting the highest delicacy was achieved, and the use of magnifying lenses, also otherwise attested, is certain. For the cutting, splints of corundum were used, as well as the drill. See PRECIOUS STONES, JEWELRY, DIAMOND, etc.

**Gemsbok.** See ORYX.

**Gena.** Cheek-plates of insects.

**Gendarmes.** From 1513 to 1778 this name was given to various privileged companies of household troops established by the French kings. The Assembly, 1790, established the gendarmerie as a semi-military body of police, both horse and foot. They are recruited from the army, and Paris alone has its separate guard.

**Gender.** In Grammar, a distinction in names answering to natural distinctions of sex. In Old English, German, Latin, Greek, and Sanskrit, most names of inanimate things are masculine or feminine, the rest being neuter. In French, Italian, Spanish, Portuguese, and Hebrew, all are either masculine or feminine.

**Genealogy.** Science of pedigrees, or tabulating the ramifications of family descent. Purity of lineage has always been of importance on account of the privileges awaiting those who can prove their aristocracy. Hebrew genealogies are tribal and ethnological rather than personal. The Greeks and Romans also liked to trace their descent from gods and heroes. Genealogy maintained its importance in Rome until the time of Constantine, when the dignity of patrician ceased to be hereditary. In modern Europe surnames were not used till ab. 1100, and were confined to the great nobles till the 13th century; so that all pedigrees of high antiquity are spurious. The rise of the rich commoners in the 15th and 16th centuries gave the science its great impetus.

**Genealogy,** HEBREW. Notable for frequent omission, obscure links of ancestry, so that no certain conclusions as to chronology can be founded upon it.

**General.** In Europe, next highest military rank to that of field marshal; in the U. S., highest rank, held only by Washington, Grant, Sherman, and Sheridan; since abolished. A general's proper command in European armies is corps d'armée.

**General Assembly.** In Presbyterianism, supreme church court, made up of commissioners from all the presbyteries.

**General Bass.** See THOROUGH BASS.

**General Convention.** Triennial assembly of P. E. Ch., consisting of the bishops, and clerical and lay deputies from each diocese.

**General Court-Martial.** Body of military officers, from 5 to 13, formed to try officers or enlisted men; convened, in time of peace, by a general commanding an army, a territorial division, or a department, or by a colonel commanding a separate department; in time of war, by the commander of a division, of an army corps, or of a separate brigade. Officers can be tried only by a general court-martial; for serious offenses soldiers may be tried either by a garrison or a field officer's court.

**Generalization.** Process of forming wider conceptions by the application of terms to include new species.

**Generalized Type.** See SYNTHETIC TYPE and COMPREHENSIVE TYPE.

**General Officers.** Those superior in rank to a colonel. In the U. S. Army the order of rank is: General, Lieutenant-gen., Major-gen., Brigadier-gen. The corresponding commands are corps d'armée, division of a corps, and a brigade of a division. The lieutenant-gen. has no specific command, and this rank, like that of general, no longer exists in our service. There are now 3 major-generals and 6 brigadier-generals in the U. S. Army. Besides these, the chiefs of the several military bureaus in the War Department have the rank of brigadier-gen.; viz., Adjutant-gen., Inspector-gen., Quartermaster-gen., Commissary-gen., Judge Advocate-gen., Surgeon-gen., Chief of Engineers, Chief of Ordnance and Chief Signal Officer, making a total of 3 majors and 15 brigadier-generals.

**General Paralysis,** or PARESIS. Popularly termed softening of the brain, and marked by increasing dementia with exaggerated notions of the person's wealth, power, strength, etc., and a progressive paralysis of the voluntary muscles. It is incurable, and may run its course in a few months or last several years.

**General Ship.** One offered for the common carriage of goods for the general public.

**General Theological Seminary** OF P. E. CH. In New York City; opened 1819, incorporated 1822. It has (1895) 10 professors, 135 students, and 1,270 alumni.

**Generatio Æquivoca.** Spontaneous generation. See ABIOGENESIS.

**Generation.** 1. Act of reproducing an individual; sexual when the union of a male and female element is necessary; *e.g.*, an ovum and a spermatozoid; and asexual when the process is one of fission, budding, etc., as in the case of *Protozoa*. 2. Period; with human race is 33 years, which represents the average length of life of the individuals born about the same time. See SPONTANEOUS GENERATION and REPRODUCTION.

**Generative Blastema.** Undifferentiated cells of an embryo which are to become the ovaries or testes.

**Generatrix.** That which by successive positions produces any locus or geometric magnitude. A point is the generatrix of a line.

**Genesee.** Bed of black shale overlying the Hamilton formation in the State of N. Y. See DEVONIAN.

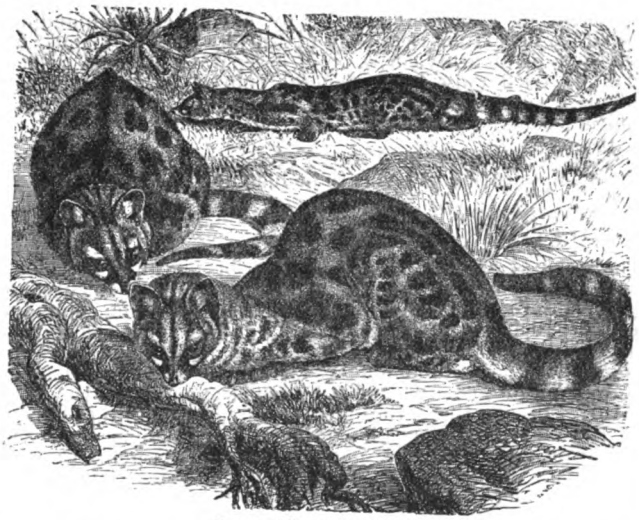
**Genesis.** The production of living beings. See REPRODUCTION and BIOGENESIS.

**Genesis.** First book of O. T., narrating the birth of the world and beginnings of human history. Its authorship is supposed to be Mosaic or composite.

**Genesis of Species.** Origin or production of species of living organisms. This may be by direct creative fiat in the remote past, or by natural processes, such as we see going on about us to-day. Biologists, led by Darwin and others, are inclined to accept the latter view. See DARWINISM and NATURAL SELECTION. In this view, Nature produces individuals only, and according to the law of Heredity. In the course of time, these individuals, struggling for existence, spreading into various regions of the earth, and acted upon by various conditions, develop new characters that make them more unlike. Variation, acting from a multitude of new centers, continually multiplied with the birth of each new individual, serves to emphasize the differentiation; finally, under the continuous selection by Nature of those individuals best fitted for each environment, there results that relationship between living beings which enables us to classify them into groups and subgroups. See CLASSIFICATION, VARIATION, and DEVELOPMENT. The idea of species is thus only an idea in the mind of man, not strictly corresponding with anything in Nature. See SPECIES.

**Genet.** Cat-like animal indigenous to the countries about the Mediterranean. It is related to the Civets (*Viverridæ*), from which it differs in having no pouch for the reception of

the special perfume secreted by members of this family. It is long and slender, with short legs, a long tail ringed with black,



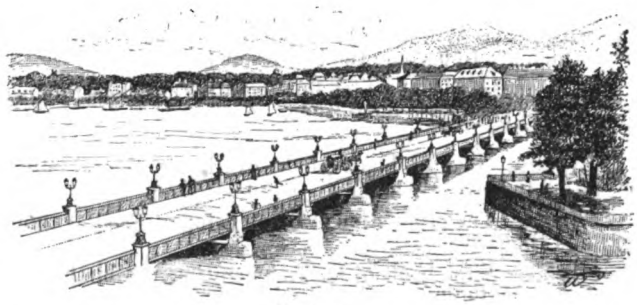
Genet (*Viverra genetta*).

and has black spots on the body. In Constantinople it is kept in houses as a mouser.

**Genêt,** or **Genest,** EDMOND CHARLES, 1765–1834. French Minister to the U. S. 1793–94; recalled, at Washington's demand, for trying to bring on war with England.

**Genetic Psychology.** That treatment of the science of mind which endeavors to obtain an understanding of complex mental states as we know them through an inquiry into the simpler mental states of the child and the lower animals; in other words, to trace the unfolding of the modern adult human mind from lower forms of mental activity. The genetic method in psychology, which is being pursued with great activity, is a direct application of the theory of development and has already thrown much light on many obscure questions. See COMPARATIVE PSYCHOLOGY.

**Geneva.** City of Switzerland, at the outlet of Lake Geneva and of the Rhone. It has a continuous history from the time of Cæsar, and is famous for its schools, collections, and the manufacture of watches; under Calvin it was an influential center of the Reformation 1536–64. The *Genevan Bible* was



Geneva.

printed 1557. The dukes of Savoy made a last attempt to recover it 1602. It was annexed to France 1798, joined the Swiss Confederation 1815, and adopted a liberal constitution 1847. The University has 5 faculties, with 111 instructors, and a library of 110,000 vols. Pop., with suburbs (1888), 71,807.

**Geneva,** CONVENTION OF. Agreement between leading powers, entered into 1864, since enlarged and acceded to by most States, for neutralizing persons and property devoted to the care of the sick and wounded in war. The Red Cross Society, then established, was very useful in the Franco-German war, and is respected by all civilized powers.

**Geneva Arbitration.** Acts and findings of a tribunal which met at Geneva 1871–72. It consisted of representatives from England, the U. S., Italy, Brazil, and Switzerland, appointed to settle the claims of the U. S. upon Great Britain for damages from the depredations of the Confederate cruiser ALABAMA (q.v.), which had been built and fitted out in British territory. The tribunal decided that England should pay the U. S. ab. $15,000,000.

**Geneva Stop.** Device to prevent a wheel from being turned through too great an angle, or more times than desired. Two wheels are required: one is a wheel of one tooth; the other has the necessary number of normal spaces in it to allow the first one to move it through one space per revolution for the desired number of turns of the former. The parts of the large wheel between spaces are made so as to fit the dead part of the first wheel, so that the former cannot move between contacts of the driving tooth. When the first wheel has made the desired number of turns, a space in the second wheel is filled, so that the latter prevents the first one from further revolution in that direction. It is used to prevent overwinding of watches, or other spring-driven mechanism.

**Geneviève,** ST., ab. 424–512. Patron saint of Paris, whose prayers saved the city from the Huns. Her name has been taken by an order of canons, founded 1614, and one of lay sisters 1636.

**Genga,** GIROLAMO, 1476–1551. Italian painter and architect.

**Genghis Khan.** See JENGHIZ KHAN.

**Geniculate.** Organs bent at an angle.

**Genie.** See JINNEE.

**Genii.** Protecting spirits supposed by the Romans to accompany all material beings like spiritual doubles through their existence. They were worshiped as divinities. See JINN.

**Genital Area** (OF SEA-URCHIN'S SHELL). See GENITAL PLATES.

**Genital Lamella.** Plate-like ovaries or testes of Jellyfish, which project into the gastrovascular pouches.

**Genital Plates.** Pieces in the shell of a sea-urchin through which the reproductive glands open. They lie at the apices of the interambulacral zones.

**Genius.** Creative ability of an exceptional character. Such a definition would include much of what is ordinarily designated as talent, *i.e.*, any mental endowment rising above the average. It is impossible in the present stage of psychological analysis to draw a line of distinction between these degrees of exceptional ability. Various psychological peculiarities, *e.g.*, unusual power of concentration of attention, of association by similarity, etc., have been assigned as distinctive of genius, but none of the explanations thus far offered are free from serious objection. A school of thinkers has lately come into prominence which holds that genius is akin to, if not actually a mark of, nervous degeneration in one form or another; a proposition now being actively discussed.

**Genlis,** STÉPHANIE FÉLICIT (DUCREST DE ST. AUBIN), COMTESSE DE, 1746–1830, m. 1761. French author, governess to the children of the Duc de Chartres. *Theater of Education; Annals of Virtue; Mlle. de Clermont.* Her writings were numerous; her *Memoirs* filled 10 vols.

**Gennesaret,** LAKE OF. Enlargement of the upper Jordan, famous as the chief scene of Our Lord's activity, ab. 12 m. by 8; abounding in fish; 68 ft. below sea-level; also called Sea of Tiberias and Sea of Galilee.

**Genoa.** City and seaport of n. Italy, on the Gulf of Genoa. Capital of the ancient Liguria; destroyed by Mago 205 B.C., rebuilt 202 B.C.; held by Lombards, Franks and Germans; pillaged by Saracens 936; in alliance, and then at enmity, with Pisa; a strong naval power by 1100; at war with Venice from 1244 to 1381; governed by doges 1339, by Milan 1464, by France 1499–1528; made the Ligurian Republic 1797; part of France 1802–14. It has a large commerce, and manufactures of silk and velvet. Pop., 1891, 210,000.

**Genouillère.** That part of the parapet of a gun battery in front of a gun which lies below the sole of the embrasure; it is about knee-high above the platform on which the gun rests, and is named from the French *genoa*, the knee.—Also steel knee-covering introduced ab. 1230, the beginnings of the plate-armor in which knights ultimately incased themselves.

**Genovesi,** ANTONIO, 1712–1769. Prof. Naples 1754; pioneer of political economy in Italy. *Metaphysics; Logic; Lessons of Commerce.*

**Genre Painting.** That which treats trivial, domestic and anecdotal subjects, as distinct from historical, mythological, or religious art.

**Gens.** In Rome, clan or group of families, having the same name, a common ancestor, and the same religious rites. A tribe or union of tribes, of common descent, and having the same emblem or crest.

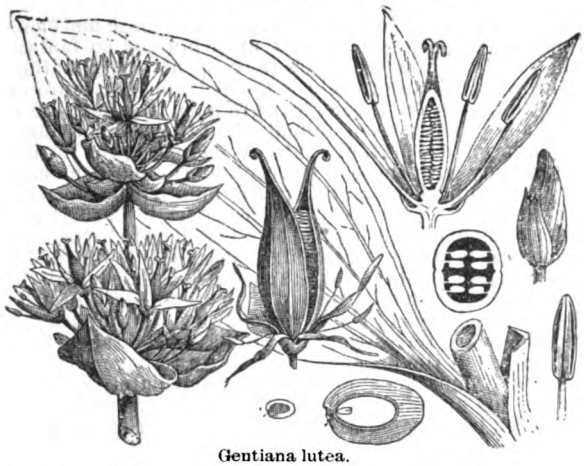
**Genseric,** d. 477. King of the Vandals. He sacked and burned Hippo A.D. 431; took Carthage 439 and made it his capital; harried Sicily, and sacked Rome 455.

**Genth,** FREDERIC AUGUSTUS, 1820–1893. Prof. Univ. Pa. from 1872; writer on chemistry and on the mineralogy of N. C. and Pa.

**Genthite.** $H_4(Ni,Mg)_4Si_3O_{12}$. Hydrous nickel and magnesium silicate associated with chromite in Lancaster co., Pa.

**Gentian.** Plants of the genus *Gentiana*, mainly with showy blue flowers; of wide geographical distribution. The dried root is an important drug. It is used as a stomachic tonic,

being given in the form of extract, or compound infusion. It tends to promote the appetite and aid digestion.



Gentiana lutea.

**Gentian,** HORSE. See FEVER-WORT.

**Gentiana Blue.** See SPIRIT BLUE.

**Gentianaceæ.** Natural family of flowering plants of the class *Angiospermæ*, sub-class *Dicotyledons*, and series *Gamopetalæ*, comprising 49 genera and ab. 575 species, widely distributed throughout the globe; commonly called the Gentian family.

**Gentiles.** Nations; name given by Jews to the rest of the world, as foreigners destitute of true knowledge of God.

**Gentlemen-at-Arms.** Bodyguard of the British sovereign, instituted by Henry VIII. 1509. The corps consists of a captain, lieutenant, standard-bearer and 70 gentlemen, all army officers of distinguished service. Their duties consist of attendance at court and state ceremonials.

Gentlemen-at-Arms.

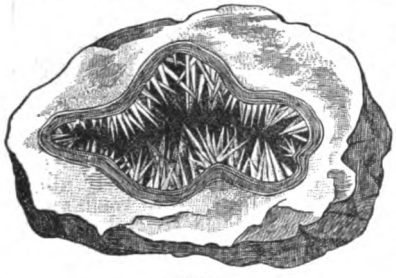
**Gentoo.** Name given by the Europeans in India to those races occupying the country from Madras to Ganjam. It is a corruption of the Portuguese gentio, a Gentile.

**Genuflexion.** Method of conjugation in certain of the *Zygnemaceæ*, two filaments of the Alga being brought into contact by knee-like bends.

**Genus.** Assemblage of species with certain common characters; *e.g.*, genus *Felis* includes species of cats as the Lion (*F. Leo*), Tiger (*F. Tigris*), Leopard (*F. pardus*), etc.

**Geocentric Place** OF A HEAVENLY BODY. Appearance if viewed from the center of the earth.

**Geocores** (LAND-BUGS). Tribe of *Hemiptera*, having four- or five-jointed antennæ, directed forward, and with a long rostrum.



Geode.

**Geode.** Rock cavity lined with crystals.

**Geodesic Co-ordinates.** Polar co-ordinates on a curved surface, using a geodesic line as the initial line for the polar angle, and determining any point on the surface by this angle and distance on a geodesic line.

**Geodesic Line.** Curve such that its arc between any two neighboring points is shorter than the arc of any other curve on the surface, joining the two points.

**Geodesy.** Surveying done with such accuracy, or covering so large an area, that the shape and size of the earth must be taken into account. Rude measures of the size of the earth were made in the 17th century, but the first to employ modern scientific methods were the surveys made by the French early in the 19th century to determine the length of the earth's quadrant. The processes of geodesy are base line measurements, triangulation, latitude, longitude and azimuth observations, leveling and determinations of the force of gravity. By these the positions of stations on the earth's surface are determined absolutely with respect to geographical position and elevation, and also relatively with respect to distance and direction. These stations form the starting points of topographical and local surveys from which maps are made. Central Europe is now covered with geodetic triangles, as are portions of Russia, India, and the U. S. In the computation of geodetic work the known dimensions and ellipticity of the earth are constantly used. In America the U. S. Coast and Geodetic Survey has charge of this class of work; in England the Ordnance Survey. See EARTH.

**Geoffrey** OF MONMOUTH, ab. 1100–ab. 1154. Welsh chronicler; Bp. of St. Asaph 1152. *Historia Britonum.*

**Geoffrin,** MARIE THÉRÈSE (RODET), 1699–1777. French social queen. Of humble birth and limited education, she used her wealth and wit to form a salon, and made the encyclopedists her admiring friends.

**Geoffroy,** ETIENNE FRANÇOIS, 1672–1731. French chemist and physician; prof. of Medicine in the Jardin des Plantes 1712–31. *Tractatus de Materia Medica; Tables des Rapports.*

**Geoffroy Saint-Hilaire,** ÉTIENNE, 1772–1844. Prof. of Zoölogy in Paris from 1793. He urged the unity of plan in organic structure, and had a notable controversy with Cuvier 1829. *Philosophie Anatomique*, 1818–20; *Etudes Progressives*, 1835.—His son, ISIDORE, 1805–1861, Prof. Paris 1841, followed similar studies, and wrote on *Anomalies of Organization*, 1832–37; *Domestication of Animals*, 1854; and *Natural History*, 1854–62.

**Geognosy.** Absolute knowledge of the earth, in contradistinction to geology, which embraces both such knowledge and the theories founded upon it.

**Geographical Distribution.** See ZOÖLOGICAL PROVINCES and DISTRIBUTION.

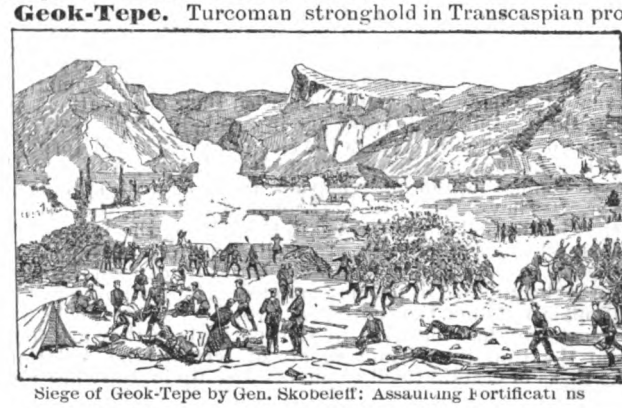
**Geographical Distribution of Diseases.** Formerly diseases were assumed to be distributed in accordance with climatic, geological, etc., conditions, but now it is believed the principal limit to their extension is the absence of the conditions suitable for the growth of their specific micro-organisms. Asiatic Cholera, long thought to be peculiar to the tropics, has extended almost to the polar circles. Tropical diseases such as yellow fever may flourish to the lines of killing frosts and even beyond. Malaria is found wherever the soil and temperature are of a certain nature. Lock-jaw is universally distributed, but is more prevalent in certain localities, such as portions of Long Island, N. Y. Mountain sickness occurs only at certain altitudes, and many affections such as Delhi boil are found in certain places only; but there is every reason to believe that they may become universally distributed. Calculous affections are rather more common in limestone regions. Cretinism is limited almost exclusively to the mountain regions of Europe.

**Geographical Mile.** Distance on the earth's surface corresponding to one minute of latitude. On a sphere whose surface is the same as that of the earth this distance is 6,080 ft., the value adopted by the U. S. Coast and Geodetic Survey.

**Geography,** PHYSICAL. Branch of knowledge which relates to the present condition of the earth's surface, whether produced by animate or inanimate agencies. It includes the form and size of the earth, its relief, with the agencies which have produced it; uplift, erosion and deposition, its drainage systems, with the laws which govern them, and its seas, with their tides and currents.

**Geography,** POLITICAL. Branch of knowledge which deals with the political institutions of man, with his forms of organization for mutual protection and improvement, and with the works of man upon the earth's surface, cities, towns and villages, roads and railroads, canals, etc.

**Geok-Tepe.** Turcoman stronghold in Transcaspian prov-



Siege of Geok-Tepe by Gen. Skobeleff: Assaulting Fortifications

inces of Asiatic Russia, 304 miles by rail s.e. of Uzunada; taken by the Russians under Skobeleff Jan. 1881.

**Geological Distribution of Animals.** See PALÆZOÖLOGY.

**Geological Succession.** Evolution of species and higher groups in past ages, as shown by fossils. See PALEONTOLOGY, DARWINISM, DESCENSION THEORY, ORGANIC EVOLUTION.

**Geology.** Treats of the structure of the earth and its physical record from the earliest times. One of the youngest of the Natural Sciences; scarcely existent before 1800. As Chemistry sprung from Alchemy, or the vain search for the Philosopher's Stone and the Elixir of Life, so Geology had its beginning in the crude speculations of early thinkers on the origin of things. Its progress was sadly impeded by cosmogonic doctrines, which

Ideal landscape of the Cretaceous Period.

had become ingrained into the theological systems of the ancients, and the superstitions of the Middle Ages. Its early history is almost a continuous narrative of attempts to harmonize the facts of Nature with the doctrines of the various sacred books, or of persecution directed against those who dared to dissent from the current dogmas of the age.

The alternate advance and recession of thought on geological subjects is well shown by a study of a few of the leading original works on the science that have been preserved.

The views of the ancient Egyptians and Indian philosophers were merely speculative. Among the Greeks the sensible teachings of Pythagoras in the 6th century B.C. are preserved in Ovid's *Metamorphose* (book xv.), and evidence a closeness of observation that would do credit to a geologist of this day.

Among other aphorisms of his we find the following: "Sea has changed into land. Marine shells lie far distant from the deep."—"Valleys have been excavated by running water, and floods have washed down hills into the sea."—"Volcanic vents shift their position. There was a time when Ætna was not a burning mountain, and the time will come when it will cease to burn."

Aristotle has left in his *Meteorics* similar profound remarks; *e.g.*, "The changes on the earth are so slow in comparison with the duration of our lives that they are overlooked, and the migrations of people cause them to be forgotten."—"The distribution of land and sea does not endure for all time."—"As time never fails, and the universe is eternal, neither the Tanais nor the Nile can have flowed forever."

Strabo, in the first century A.D., writes: "The waters have not risen nor subsided, but the level of the land has been changed, and this has brought some of it below water."—"It is proper to derive our explanations from things which are obvious and of daily occurrence."

Such views were far in advance of what we might expect from so distant a date, and indeed of those which were held in centuries long afterward. A millennium passed away before the lost or broken clew was taken up again. In the palmy days of the Moslem empire, sometimes in the guise of fable and sometimes in plain language, the writers recorded their observations and deductions. But the literary age in Bagdad passed away, and for five or six hundred years the sleep of intellectual torpor or death remained unbroken. Then Italy led the way, and the great conflict began of scientific truth against speculative error. "They tell us," wrote Leonardo da Vinci, the painter, "that fossil shells were formed in the hills by the influence of the stars: but where, I ask, are shells now forming under the influence of the stars? and how can the stars explain the origin of gravel composed of pebbles rounded as if by running water?" Falloppio of Padua, the anatomist, wrote: "Petrified shells were generated by fermentation in the spots where they are found from the tumultuous movements of terrestrial exhalations. The tusks of certain fossil elephants dug up in Italy are mere earthy concretions, and the vessels found at Monte Testaco were natural impressions that had been somehow stamped on the soil."

It is not easy now to believe that men of sense and eminence in the learned professions could utter notions so fantastical; but in reality a hundred years were spent in combating and overthrowing this absurd delusion, which apparently arose from an unwillingness, on theological grounds, to admit the existence of any other races of animals than those now living.

Steno, in Padua, prof. of anatomy, compared the fossil teeth found in Italy with those of a recent shark, and demonstrated their close similarity. But Bernard Palissy, the potter, was, said Fontanelle, the first who dared assert in Paris that fossil remains of shells and fishes had once belonged to living animals.

Two centuries more were spent in an equally severe and obstinate struggle against the not less absurd doctrine that all the fossils, which were now admitted to be of organic origin, had been buried by the deluge of Noah. Woodward, at Cambridge, conceived the whole terrestrial globe to have been taken to pieces and dissolved at the flood, and the strata to have settled down from this promiscuous mass. Ray immediately exposed the fallacy of his argument, showing that heavy and light bodies are mingled in the same stratum. Thomas Burnet published his *Sacred Theory of the Earth*, 1681–89, containing an account of its origin and of all the changes which it will undergo until the consummation of all things. In it he showed how the crust of the earth had been fissured at the deluge by the sun's rays, so that it burst, and the diluvial waters were let loose from a supposed central abyss. Whiston followed in a similar style. Moro and Generelli in Italy advocated more rational views. "We must abandon," said they, "the doctrine, once so popular, which denies that organized fossils were derived from living beings, and we cannot account for their present position by the theory of Strabo, or by the universal deluge as explained by Woodward; nor is it reasonable to call the Deity in capriciously upon the stage and make Him work miracles for the sake of confirming our preconceived hypothesis. I hold in utter abomination those systems which are built with their foundations in the air and cannot be propped up without a miracle."

About 1700 Leibnitz propounded the doctrine of an original liquid globe, covered, after it had sufficiently cooled, with a universal ocean, a long and bold step in advance. Buffon followed him, explaining the formation of strata by the violent action of water. For some of his teachings he was summoned before the Faculty of Theology at Paris and requested to recant, which he did by adding to the next edition of his book these words: "I abandon everything in my book respecting the foundation of the earth, and generally all that may be contrary to the narration of Moses."

Toward the end of the 18th century the chief event in the progress of geology was the beginning of the Neptuno-Plutonic

Ideal landscape of the Devonian Period.

controversy, during which for many years the advocates of water as the great geological agent waged fierce fight with those of the opposite school, who attributed nearly all the observed phenomena to the action of heat. (See WERNER and HUTTON). The right was partly on both sides. But while the champions were thus striving for the mastery, a single man, unaided by wealth or station, was doing more for the science than either of them. William Smith, an English surveyor, published in 1790 his *Tabular View of the British Strata*, in which he announced the doctrine that there was a definite order of succession in the strata, and that this order was never inverted. To this most important principle he added another equally novel and significant: that these strata could be recognized in different places by the fossils which they contained. If Smith's first thesis contained the elements of systematic Geology, his second not less truly contained those of Paleon-

tology; to his work is due the setting of both sciences on a solid base for the first time. He has been justly called the Father of English Geology.

Following his labors came a persuasion that the habits of speculation which had been indulged in for so many years were not leading, or likely to lead, to any definite or satisfactory results. A reaction set in in favor of collecting the facts rather than theorizing about them first. The prevalence of this sentiment was marked by the establishment in 1807 of the Geological Society of London, the parent of all others now existing. Its avowed object was to multiply and record observations, and await the result at some future period, with the belief that the time was not yet come for a general system of geology. The wisdom of this course has been fully proved by the solid and enormous advance which the young science has made since it was freed from the visionary and the supernatural. A short account of its later successes will show in strong contrast the progress of the present century.

The work of William Smith was limited to the English Mesozoic rocks in his *Tabular View*. But in 1815 he pub. a geological map of England, the first ever constructed, which

Ideal view of a marshy forest of the Coal Period.

remains a lasting monument of original talent and extraordinary perseverance; for he had explored the whole country on foot without the guidance of previous observers or the aid of fellow laborers, and had succeeded in throwing into natural divisions the whole complicated series of British strata. Later geologists continued the work which he had begun, and the Carboniferous system was added to the geological column. The Devonian system followed, chiefly through the investigations of Miller in Scotland, and Murchison in England. The latter afterward defined the Silurian system in South Wales; the yet older strata below these were erected by Sedgwick into his Cambrian system. Later still the rocks overlying the Mesozoic were divided by Lyell into the Eocene, the Miocene, the Pliocene, and the Pleistocene, and the outline of the geological column was completed.

Through the labors of these and other geologists in Britain and on the Continent the new science rapidly assumed a commanding position, and the name Geology displaced that of Mineralogy, under which it had previously been known. Swiftly it emerged from the contempt with which it had been regarded in consequence of its lowly origin and semi-fabulous ancestry. The visions of the past were dispelled by accurate observation and logical induction. PALEONTOLOGY (q.v.) gave powerful assistance in the work. Catastrophe and Cataclysm gradually disappeared, and the doctrine of Uniformity, preached by Lyell at first to deaf ears, taught us to see in the past only the action of causes still real and potent in our own day. The short span of a few thousand years, within which the cosmogonists had attempted to compress the whole terrestrial and celestial history, gradually lengthened out into almost illimitable eras, where years gave place to millenniums. The conception of a ready-made earth was supplanted by that of its evolution by slow and natural forces through countless centuries from a vaporous hazy mass of cloud. The nebular hypothesis, first formulated by Laplace, has become an accepted article of the scientific creed, and the liquefaction, solidification, and cooling of the planets have become the subjects of mathematical calculation. Life, too, which a few years ago was thought to have been first breathed on the Earth some sixty centuries before our day, is now seen running back into a past so distant that imagination fails to conceive it, and yet its beginning seems almost infinitely earlier still. The doctrine of the antiquity of man, more obstinately contested than all the preceding by the conservative, and especially by the theological schools, has itself been established on a basis too firm ever again to be overthrown; far from being a new-comer on the planet, man's civilized condition is now found to be older than the date previously assigned to his creation.

All these victories over tradition and prejudice have placed Geology to-day among the foremost of the sciences. But other struggles are yet in progress, other victories almost in sight. The secret of the Highlands, revealed by fifty years of labor, tells us of shoves and thrusts in the crust that have transferred whole counties bodily from their former position, and thereby supplies us with a key to similar enigmas elsewhere. The conditions of the oceanic abysses, discovered by deep sea dredging, bid fair to throw light some day on the question of their permanence and of the stability of the continental masses. The temperature and condition of the Earth's interior will probably long remain unknown. But even the problems connected with these do not appear to be now hopelessly out of reach. The complications of the Ice Age, the topic of keen and at times acrimonious discussion, are gradually yielding under patient scrutiny, and one by one its almost hopelessly confounded threads are being disentangled.

The microscope and the lapidary's wheel have been pressed into the service, and by their aid we hope some day to read in the structure of the rocks the story of their formation, and to establish in Pre-Cambrian and even in Archæan strata some law of succession as valid as that afforded by fossils in younger rocks. Moreover, the features of the Earth's surface, its physiography, so to speak, are made by close scrutiny to reveal their origin and to show the changes that have taken place in river systems by the gradual erosion of the land and the transfer of the waters from one basin to another. This is the new branch of Geomorphy. Extinct geographical outlines are being restored, and we are gradually becoming familiar with the geography of the past, with the continents, oceans, lakes, rivers, and seas of bygone ages. Geology is thus fulfilling her great purpose of giving us a complete physical record of Earth from the earliest times to the present. But far from being content even with this, she is pushing her researches into the future and anticipating changes yet to be, the outcome of the forces that have evolved the present from the past.

**Geomancy.** Method of divination by observing lines or points upon the earth, practiced at the present day in China, where the professor of this art is consulted upon the erection of houses and the location of tombs. The science there rests upon a very general and popular superstition known as Fung-Shui, or "Wind and Water," not connected apparently with the orthodox religions, but surviving from primitive times.

**Geometrical Mean** OF TWO NUMBERS. Found by extracting the square-root of their product.

**Geometrical Progression.** Series of quantities related by a constant ratio. If a. represent the first term and r. the ratio, the series will be a, ar. $ar.^2$ $ar.^3$ .....$ar^{n-1}$. Each term contains the first term, multiplied by the ratio raised to a power one less than the number of the term. If "$a_n$" represent the "nth" term; $a_n = ar^{n-1}$ (1). If "$S_n$" represent the sum of "n" terms, $S_n = \frac{a(r^n 1)}{r-1}$ (2). As these two equations involve five elements, any three being given, the others may be found. If the ratio be greater than unity, only the sum of a limited number of terms can be found. If the ratio be a proper fraction, the series is convergent, and the sum of an unlimited number of terms may be known. This sum equals $\left(\frac{a}{1-r}\right)$ the first term divided by one less the ratio. A Geometrical Progression is a Recurring Series of the first order.

Birch-Moth (*Amphidasis betularia*).

**Geometrina.** Tribe of *Lepidoptera* or Measuring-Worms, whose caterpillars are known as Loopers, from the mode of walking. They have five or six pairs of abdominal feet, by which they cling, while the anterior end is free. Many species are hurtful to fruit trees. The adult is slender, with large wings, which at rest are tectiform; *i.e.*, the wings of the moths slope away from the back like the sides of a roof from the ridge.

**Geometry.** Mathematics treating of quantity in definite form. The primary element of form is the point which has, mathematically, position without magnitude. Other elemental geometric concepts are lines, surfaces, and solids. The character, relations, measurement of these, singly or combined, are the subjects of discussion. Traces of geometrical knowledge and teaching are found in the study of the earliest civilizations.

The works of Euclid of Alexandria, ab. 300 B.C., were for many centuries the basis of geometrical study, and little progress was made until the 17th century. While previous workers had made advances, the introduction by Descartes of a system of co-ordinates and the full application of analysis to Geometry marked a new era. Since that time new forms of treatment have been introduced, new relations ascertained, the scope of research widened, and fundamental hypotheses changed. We have now, distinct from the old, a Modern Geometry, itself subdivided, and a non-Euclidian Geometry.

**Geometry,** Analytical. This expresses the qualities of form in algebraic equations and interprets algebraic expressions as determining form. To effect this, measurements called co-ordinates, referred to arbitrary fixed elements, are used. Analytical geometry submits the algebraic expressions of form-relations to reduction, and thus deduces further qualities and relations.

**Geometry,** Descriptive. Method of projecting distinct geometric forms, so that their metrical properties may be known; introduced by Monge 1794.

**Geometry,** Elliptic. That which assumes space to have a definite boundary separating real from imaginary points.

**Geometry,** Hyperbolic. That which assumes that space returns into itself, having no points beyond certain finite distances.

**Geometry,** Modern. Highly generalized discussions of modern mathematicians. While many of its fundamental principles have been long known, their arrangement, full application, and value, are due to the investigations of the present century. Poncelet, Möbius, Desargues, Steiner, Brianchion, Chasles, Grassmann, Dirichlet, Jacobi, Hesse, Hamilton, Sylvester, Cayley, and Staudt are the more noted modern geometers. The point and line at infinity, polar reciprocation, harmonic and anharmonic ratios of points and pencils, determinants, quaternions, special system of co-ordinates, and the discussion of generalized loci, are particular developments of this modern research.

**Geometry,** Non-Euclidian. That which recognizes space as possibly having more than three dimensions.

**Geometry,** Projective. Modern treatment, basing results as a whole upon central projection of figures.

**Geomorphy.** Geological doctrine of modern origin, whose fundamental principle emphasizes the action of rivers and streams in shaping the earth's surface. It teaches that river erosion, immediately on the emergence of the land, begins the process of again degrading it to sea-level, and that this process continues, unless interrupted by re-elevation, until the whole surface is reduced to the sea-level. On this principle physical geography recognizes the youthful period of a river when it flows in a canyon, the middle-aged period when the canyon has become an open valley, and the senile period when the country has become almost flat and the river has nearly ceased to flow. The relief of the surface thus supplies a clew to its age; the study of this relief as it exists at present, and the investigation of its past history and the important consequent changes of drainage, are some of the problems presented.

**Geomori.** Rural nobles of Athenian empire.

**Geomydæ.** See Myomorpha.

**Geophagy.** Dirt-eating, or the eating of certain varieties of soft clay common among many of the degraded savage races, and sometimes observed in unhealthy scorbutic children in warm countries.

**Geo-Physical Observatory.** Institution devoted to the study of the physical relations of the earth, especially its meteorology, tides, magnetism, gravitation, temperature, earthquakes and volcanoes.

**Geoplanidæ.** See Planarians.

**Geordie.** Safety-lamp; so called by English miners from the inventor, George Stephenson.

**George,** St. Patron of England; said to have been a noble in Cappadocia, and a martyr 303. St. George is venerated in the Eastern and Latin Churches, and even by the Mohammedans is regarded with great reverence. He is distinguished for his

St. George Conquering the Dragon (by Raphael, Louvre Gallery).

exploit of rescuing a king's daughter from a dragon, a mediæval invention.

**George I.,** 1660–1727. Great-grandson of James I.; Elector of Hanover 1698; King of England 1714, on Anne's death; a poor creature, but useful as King Log. He knew no English, and hated England, which under him was ruled by Walpole. The Jacobite rebellion 1715, the South Sea Bubble 1720, and the Spanish war 1726, marked his reign.

**George II.,** 1683–1760. Son of George I.; King 1727; more German than English, but fond of war, and in command at Dettingen 1743. His reign was prosperous, marked by victories abroad and by the suppression of the second Jacobite rebellion 1745.

**George III.,** 1738–1820. Grandson of George II.; King 1760; of British sympathies and private virtues, but narrow and bitterly conservative. His long reign was full of events, chief among them the American Revolution and the Napoleonic wars. His mind, always feeble, gave way repeatedly from 1789, and totally 1810.

**George IV.,** 1762–1830. Son of George III.; Regent 1810, King 1820; called by Scott "the first gentleman in Europe"; not an exemplary person. His conduct toward his wives, Mrs. Fitzherbert (m. 1782) and Princess Caroline of Brunswick (m. 1795), whom he deserted 1796, was not kingly.

**George I.,** of Greece, b. 1845. Son of Christian IX. of Denmark; King of the Hellenes since 1863.

**George,** Henry, b. 1839 in Phila. Writer on political economy and agitator for economic and social reforms; advocate of the Single Tax on land; ed. N. Y. *Standard* since 1887. *Our Land and Land Policy*, 1871; *Progress and Poverty*, 1879; *Irish Land Question*, 1881; *Social Problems*, 1884; *Protection or Free Trade?* 1886.

**George,** James Zachariah, b. 1826. Chief-justice of Miss. 1879–81; U. S. Senator since 1881.

**George,** Lake, or Horicon. In n. e. N.Y., connected with Lake Champlain; 36 m. long; noted for its beauty; lined with summer resorts; scene of Dieskau's defeat by Sir W. Johnson 1755, and of other events in the French and Revolutionary wars.

**Georges,** Karl Ernst, b. 1806. German author of Latin lexicons.

**Georgetown.** On the Potomac, adjoining Washington, D.C. Pop., 1890, 14,046.

**Georgetown.** Capital of British Guiana; on the Deme-

Georgetown, Demerara—Sketched from the Lighthouse.

rara; founded 1774 by the Dutch. Pop., 1891, 53,176, mostly natives.

**Georgetown University,** GEORGETOWN, D.C. Chartered 1815, first building begun 1788, instruction 1792; observatory was founded 1843, medical school 1851, law 1870. It is directed by the Jesuits, has 80 professors and assistants, 725 students, and a library of 60,000 vols.

**Georgia.** Region s. of the Caucasus; an independent kingdom (with intermissions) 302 B.C.–1799; since held by Russia. The Georgians are celebrated for their beauty, and under the

Georgian Types and Costumes.

Mohammedan rule the white slaves of Egypt and Asia were drawn from among them. They have magnificent physique and are passionately fond of music and singing.

**Georgia.** One of the s.e. of the U.S. Its area is 59,475 sq. m. The surface is generally level, except in the n. part, where it rises into the hills and mountains of the s. Appalachian system. Its streams flow generally s. or s. e. to the Atlantic or the Gulf, and are navigable for long distances into the interior, the larger ones being navigable to the Fall Line. Into the n.w. corner the Great Appalachian valley extends, showing outcrops of Silurian and Carboniferous beds. This is succeeded e. and s. by the Archæan of the upper Atlantic plain, followed by a narrow belt of Quarternary and Cretaceous, the Black Belt of the farmer. Succeeding this on the s. is an area of Eocene, which, expanding, covers the s.w. corner of the State. Toward the Atlantic it is followed by Neocene beds, and by Quarternary beds nearer the coast. Its industries are agricultural: cotton raising is the dominating branch. In 1894 the cotton crop amounted to 1,183,924 bales, valued at $32,853,891. In 1890 the value of farms was $152,006,230, and in 1889 of agricultural products $83,371,482. In 1893 it had 3,116 m. of railroad. Pop., 1890, 1,837,353, of which number 863,716 were colored. Capital is Atlanta. It was one of the thirteen original States, and so named in honor of George II.; was settled by Gen. James Oglethorpe 1732, his intention being to found a colony where insolvent debtors and the religiously persecuted might begin life anew. The country was occupied originally by the Cherokee and Creek tribes of Indians, who consented to have the English enter, and from whom Oglethorpe purchased land, and laid the foundations of Savannah. A royal governor was appointed 1752. During the Revolution G. was the scene of several important battles. In the Civil War it was among the first to secede (Nov. 1860), and was again an important center of war, Sherman in his march to the sea proceeding directly through the heart of the State. Since the war it has been among the most successful of the Southern States in recovering prosperity. (See Map, p. 216.)

**Georgia,** GULF OF. Arm of the Pacific, separating Vancouver Island from British Columbia and Washington.

**Georgia,** UNIVERSITY OF, Athens, Ga. Chartered 1785; instruction begun 1801. The coll. of arts (Franklin Coll.), the school of law, and the main State agricultural coll. are at Athens, but four branches of the last exist at four different points in the State: the school of medicine is at Augusta, that of technology at Atlanta, the normal and industrial coll. for young women at Milledgeville, and a coll. for colored youth at Savannah. The library at Athens contains 20,000 vols., and there are 34 instructors and 219 students.

**Georgian Bay.** Land-locked bay of Lake Huron, opening into Canada.

**Georgian Language.** Spoken in that part of Russia known as Transcaucasia, is mainly an inflectional speech, but is generally regarded as not Aryan. It is now losing ground before Russian, but has a literature (translation of the Bible, etc.), dating back a thousand years, but richest in quality and volume ab. 1700.

**Georgium Sidus.** Planet Uranus; so named by Herschel in honor of King George III., his patron.

**Georgius Pisida,** 7th century. Historian of the Byzantine Emperor Heraclius.

**Georgius Trepezuntius,** 1396–1486. Cretan, long in the papal service. He translated many Greek works into Latin, under the patronage of Nicholas V.

**Geostatic Arch.** One so shaped that the center line of the ring is the curve of equilibrium for the pressures caused by a filling of earth around the extrados.

**Geosyncline.** Large syncline across a broad region inclosing subordinate folds. See SYNCLINE.

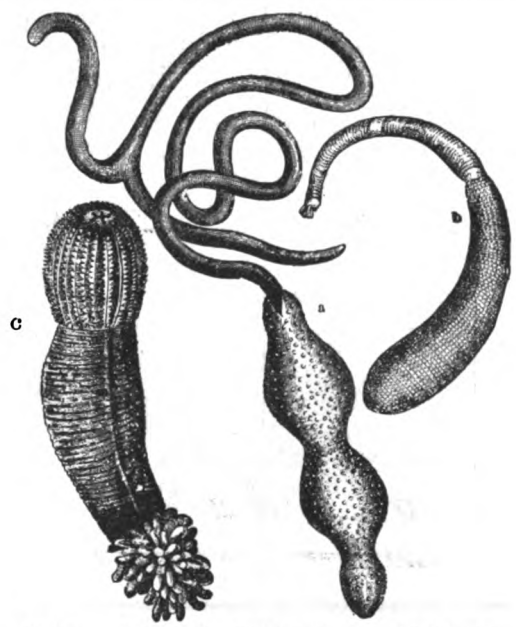
**Geotechtonic.** Dynamic actions which have given shape to the earth's surface.

**Geothermal.** Line connecting places having the same temperature at a given depth from the earth's surface.

**Geo-Thermometer.** Thermometer arranged to show the earth's temperature. It is buried in the earth, and usually its indications are made visible at the surface of the ground either by electrical appliances or by making the tube sufficiently long.

**Geotropism.** Phenomena exhibited by organs of plants when placed in positions other than the normal with respect to the action of gravity.

**Gephyrea** (SIPUNCULACEA). Worms with rather plump cylindrical body, without external segmentation, with cerebral




Gephyrea: (a) Bonellia; (b) Phascolosoma; (c) Priapulus.

ganglion, œsophageal nerve ring, and a ventral chain of ganglia. Sometimes setæ are present. The long coiled intestine

Longitude West 83 of Greenwich
85
81
35
33
31
8
4
Longitude West 6 of Washington
EXPLANATION
Capitals
County Seats
Cities & Towns
Rail Roads
Lighthouses
Scale of Miles
10 20 30 40 50 60 70 80
TENNESSEE
NORTH CAROLINA
SOUTH CAROLINA
ALABAMA
FLORIDA
GULF OF MEXICO
ATLANTIC OCEAN
Wartburg
Knoxville
Crossville
Sparta
Kingston
Pikeville
Manchester
Winchester
Jasper
Asheville
Marion
Bayson
Mt. Pisgah
Old Bald Mt.
Decatur
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Cape St. George L.H.
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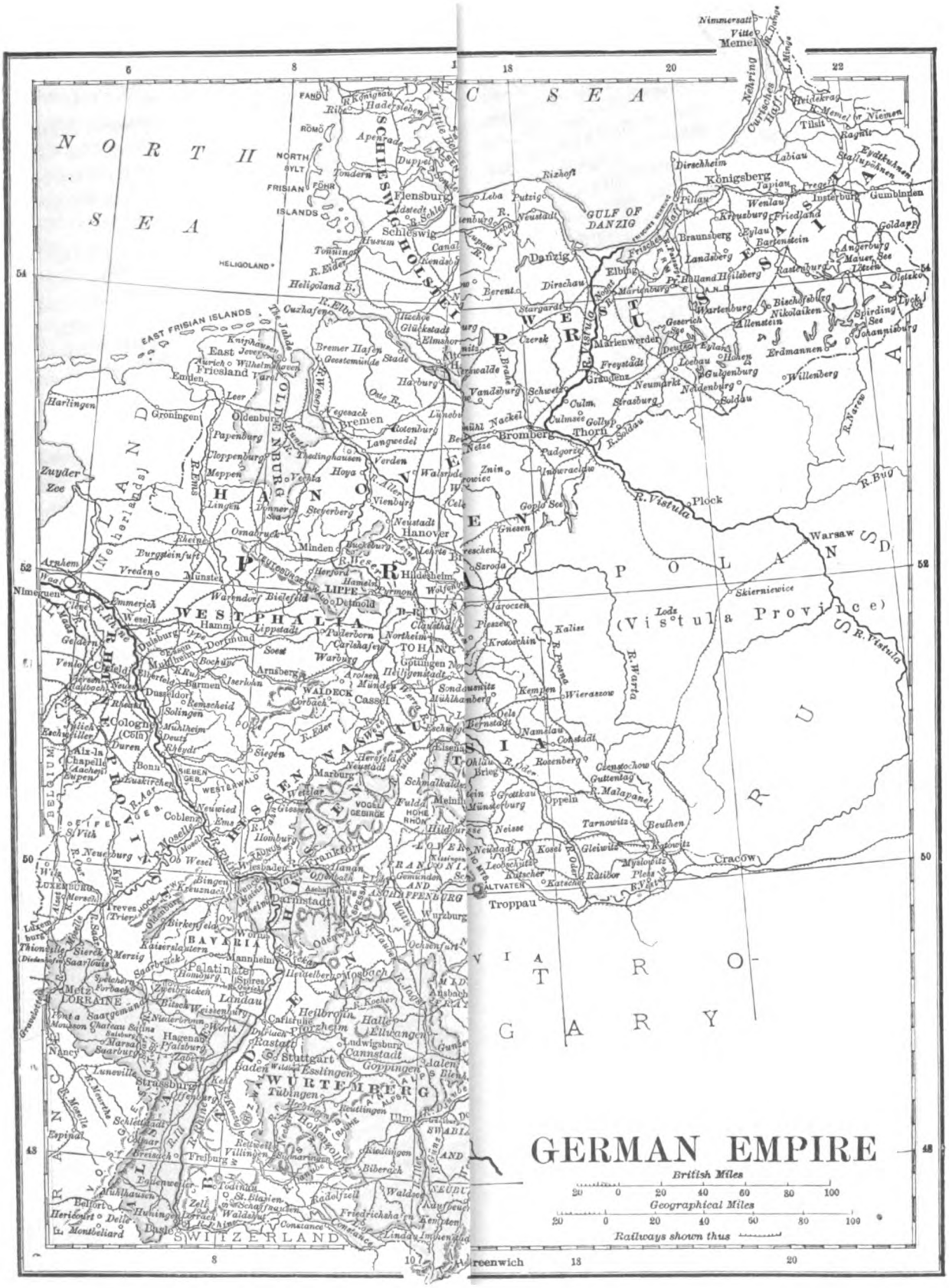

GERMAN EMPIRE
British Miles
Geographical Miles
Railways shown thus
NORTH SEA
BALTIC SEA
GULF OF DANZIG
SCHLESWIG HOLSTEIN
HANOVER
WESTPHALIA
HESSEN NASSAU
BAVARIA
WURTEMBERG
BADEN
ALSACE LORRAINE
SWITZERLAND
BELGIUM
HOLLAND
POLAND
RUSSIA
AUSTRIA
HUNGARY
Königsberg
Danzig
Berlin
Hamburg
Bremen
Hanover
Cologne
Frankfort
Munich
Stuttgart
Strasburg
Cracow
Warsaw
Greenwich

opens by an anus, either terminally or dorsally. See CHÆTIFERA and ACHÆTA.

**Gepidæ.** Teutonic tribe, who moved from the Vistula to the Danube before 400, and held the Byzantines to tribute; crushed by the Avars and Longobards 566.

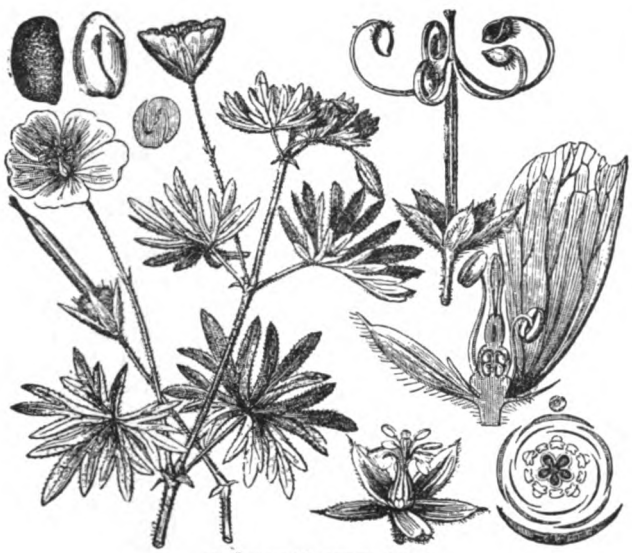
**Gera.** Capital of Reuss-Schleiz; on the Elster, 42 m. e. of Weimar. It has large woolen and cotton factories. Pop., 1890, 39,599.

**Gerace.** Town in Calabria, Italy, noted for its wine, Lachrima di Gerace. Pop., 1891, 7,700.

**Gérando,** JOSEPH MARIE, BARON DE, 1772–1842. French author; Academician 1804; law prof. Paris 1828; Peer 1837. *Hist. Philosophy*, 1803; *Visitor of the Poor*, 1820; *Moral Perfection*, 1824; *Public Beneficence*, 4 vols., 1839.

**Geraniaceæ.** Natural family of flowering plants, of the class *Angiospermæ*, and sub-class *Dicotyledons*, comprising 25 genera and ab. 985 species, distributed throughout the temperate and sub-tropical regions; commonly called the Geranium family.

**Geranium.** Genus of showy-flowered plants, natural family *Geraniaceæ*, of wide geographical distribution. The



Geranium (*G. sanguineum*).

garden plants cultivated under this name are species of the allied genus *Pelargonium*, mainly natives of S. Africa.

**Geranium,** FEATHER. See JERUSALEM OAK.

**Gérard,** ÉTIENNE MAURICE, 1773–1852. General 1805; prominent in Napoleon's campaigns; Count 1813; Marshal 1830; Minister of War 1830 and 1834; Peer of France 1832.

**Gérard,** FRANÇOIS PASCAL, BARON, 1770–1837. French portrait and historical painter, ennobled 1819. He portrayed many of its leading characters of his time. Important examples are in the Louvre.

**Gerard,** JOHN, 1545–1612. Surgeon and herbalist in London. *The Herball, or General History of Plants*, 1597.

**Gérard de Nerval.** Pen-name of Gérard Labrunie, 1808–1855. French poet, dramatist, and tr. *Faust*.

**Gerasa.** Ancient city of Decapolis. Its ruins, 20 m. e. of Jordan, are notable for their extent and fine condition.

**Gerberon,** GABRIEL, 1628–1711. French Benedictine monk, persecuted as a Jansenist by the Jesuits; long in Holland, and imprisoned 1703. *Mirror of Piety*, 1676; *History of Jansenism*, 1700.

**Gerbert,** MARTIN, 1720–1793. German Benedictine, prof. at St. Blaise in Black Forest 1745, abbot 1764; author of 5 vols. on Ch. music, 1774–84.

**Gerhard,** EDUARD, 1795–1867. German archæologist, prof. at Berlin 1844. *Etruscan Mirrors*, 1843–68.

**Gerhard,** JOHANN, 1582–1637. Lutheran theologian, prof. at Jena 1616. His *Divine Meditations*, 1606, and *Loci Communes Theologici*, 9 vols., 1610–22, are highly valued. *Confessio Catholica*, 1634.

**Gerhardt,** CHARLES FRÉDÉRIC, 1816–1856. Prof. of Chemistry at Montpellier 1844–48, and Strassburg 1855. Many of his papers are pub. in Liebig's *Annalen*, and in the *Annales de Chimie*.

**Gerhardt,** PAUL, 1607–1676. Greatest of German hymnists. Of his 131 sacred lyrics some were tr. by John Wesley 1738–42, and many are in general use in English versions.

**Géricault,** JEAN LOUIS ANDRÉ THÉODORE, 1791–1824. French historical and animal painter. His *Raft of the Medusa* and other works are in the Louvre.

**Gerizim.** Mountain in Middle Palestine, opposite Ebal. Here, at the entry of the Hebrews into Palestine, half the

Gerizim and Shechem.

tribes were stationed, to proclaim God's blessing on the observance of the Law, and the other half on Ebal, to denounce his curse on its violation.

**Germ.** Earliest form of any animal or plant, in a seed or egg; also the minute organisms generally called the microbes. See BACTERIA.

**Germain,** SOPHIE, 1776–1831. French mathematician and philosopher; discoverer of the equation for elastic plates, named from her. She contributed memoirs to the Institute, to *Annales de Physique et de Chimie*, and to Crelle's Journal.

**German Catholics.** Seceders from R. C. Ch., objecting to display of holy coat of Treves 1844. In 1846 there were nearly 300 societies; some joined the FREE CONGREGATIONS (q.v.), and in 1890 but 5,714 members were left.

**Germander.** Low herbs of the genus *Teucrium*, of the Mint family, natives of the northern hemisphere. *T. canadense*, the east American species, is known also as Wood Sage.

**German East Africa.** Territory acquired by treaties with natives and by purchase from the Sultan of Zanzibar. It

New Silver Coin for German East Africa, value 48 cents.

New Copper Coin for German East Africa, value 1 cent.

consists of a narrow strip of coast and ab. 369,000 sq. m., extending to the great lakes. Unsuited for white settlement, it

produces fine coffee and cotton. Cattle and sheep breeding are likewise of importance. It is essentially an agricultural country, but the fertility of the soil varies greatly. The German Government is represented by an Imperial Governor. Pop. ab. 2,900,000, principally Bantus and Arabs.

**German Language.** Standard language of most of the inhabitants of the German Empire and parts of Austria and Switzerland, High-German, so-called, as distinguished from Low German dialects like Platt-Deutsch. Historically it is divided into (a) Old High German, from earliest times to 1100, embracing, if Middle German be included, such old dialects as Frankish, Alemannic, and Bavarian; (b) Middle High German, 1100–1500, where the umlaut, or mutation gains ground; and (c) Modern German. Modern speech agrees with the written language, which is the developed East Frankish dialect, combining qualities of Middle and Southern German, and central in position. This dialect was used (a) as the official language of the Empire and the law courts (Kanzleisprache), and (b) by Luther in his translation of the Bible; hence its adoption as standard speech, supplanting the dialects of North Germany. German contains a much larger proportion of native Germanic words than English does, but has admitted a goodly number from Latin, French, and other tongues. Low German embraces several modern dialects, all of which were of greater extent and importance in older times: (a) FRISIAN (q.v.); (b) Low-Saxon, covering a large part of northern Germany; (c) Low Frankish, including, in the early period, Holland and the northern part of Belgium, now represented by Dutch and Flemish, but still spoken in the Rhine Province of Prussia. High and Low refer respectively to the uplands and mountains of the south, and the low-lying plains of N. Germany.

**Germanic Languages.** Family of the great Indo-European group, first known to the ancients through the Celts, who named their neighbors on the e. and n. Germani, a word of doubtful meaning, perhaps "neighbors," perhaps "those who shout in battle." The family is divided into (a) the Scandinavian and the Gothic (now extinct), sometimes coupled under the term East Germanic, and (b) the West Germanic, including High German (whence modern literary German) and Low German (including Old Saxon, Anglo-Saxon, or Old English), Frisian, and other dialects of n. Germany, some of which still survive among the peasants. The oldest remains are East Germanic, certain old Scandinavian words borrowed by other tongues and so preserved, and (literary) Ulfila's Gothic version of the Bible, 4th century.

**Germanicus Cæsar,** 15 B.C.–19. Grandson of Mark Antony; nephew and adopted son (A.D. 4) of Tiberius; father of Caligula; Consul 12; sent to command on the Rhine 13. Here he suppressed a mutiny 14; pursued the enemy into the forest; buried the remains of Varus's legions destroyed A.D. 10; twice defeated Arminius, and had begun the thorough conquest of Germany, when Tiberius, jealous of his successes, transferred him to Syria. His abilities and character were of the highest, and his death, presumably by poison, was felt to be a grievous public calamity. Tiberius had his widow, Agrippina, and two of his sons put to death.

Germanicus.

**Germanium.** Ge. At. wt. 72.3, sp. gr. 5.469, sp. ht. .075, mpt. 900° C. Valence II. IV. Discovered by Cl. Winkler 1886; grayish-white, brittle metal, not soluble in hydrochloric acid, but readily in aqua regia. It forms two classes of salts, germanous, in which it is bivalent, and germanic, in which it is quadrivalent. It resembles tin more closely than any other element. It occurs in Argyrodite, a sulphide of silver, iron, and zinc. It is identical with Ekasilicon, whose existence had been predicted by Mendelejeff.

**Germanium Chloroform.** $GeHCl_3$. Bpt. 72° C. Colorless, thin, fuming liquid. Made by heating the metal in hydrochloric acid gas at a low temperature.

**Germanium Dioxide.** $GeO_2$. White powder, obtained by heating the sulphide with sulphuric acid. See GERMANIUM TETRACHLORIDE.

**Germanium Tetrabromide.** $GeBr_4$. Similar to G. tetrachloride.

**Germanium Tetrachloride.** $GeCl_4$. Bpt. 86° C. Colorless fuming liquid. Formed with evolution of heat and light when chlorine is passed over germanium; decomposed by water into the dioxide.

**German Literature.** There are three broadly-marked periods in this. The first is that anterior to the Reformation, and begins with the *Minnesingers*. The National Epic, the *Niebelungen Lied*, is in itself a great literary monument. The centuries following, the 14th and 15th, show a decadence. The *Meistersingers* succeed, and then verse is at best mediocre. These centuries, however, produced the two great satires *Reinecke Fuchs* and Sebastian Brant's *Narrenschiff*, put into Eng. version 1509 by Alexander Barclay as *The Ship of Fools*. The second period is that of the Reformation. Luther's translation of the Bible gave Germany a classical language of its own, and though no other great name appears, the seeds of modern German literature were planted. The third period begins ab. 1750. Klopstock was its herald. There come then in quick succession the names of Lessing, Herder, Goethe, and Schiller. Two strongly-marked currents flow all through the period. One tends to philosophy, and bears such masters as Kant, Fichte, and Hegel; the other is literary and carries one name which holds rank with the world's great masters, Goethe. The subsequent literary activity of Germany is seen in nearly all departments, especially in the profound research of scholars and the lighter labor of novelists.

**German Measles.** Mild infectious febrile disorder, usually lasting about one week, with an eruption like that of measles but lighter in color and irregularly disposed. Also termed Rubeola.

**German School of Painting.** See COLOGNE, SCHOOL OF. DURER, HOLBEIN, DENNER, KAUFFMANN, MENGS.

**German Silver,** or ARGENTAN. Alloy of 10 to 20 per cent of nickel, and 20 to 30 of zinc, the remainder copper.

**German Tinder.** Soft substance obtained from the woody fungus *Polyporus fomentarius*, which, with saltpetre, forms an inflammable mixture.

**Germantown.** Suburb of Philadelphia, Pa.; scene of a battle Oct. 4, 1777, in which Washington surprised the army of Gen. Howe, but his troops, being seized with panic, fled, with a loss of 1,000; the British loss was 600.

**Germany.** Empire of central Europe. The area is 208,700 sq. m. The s. part is mountainous, with high mountains alternating with deep valleys. The middle portion is an elevated plane, while in the n. the country is low and level. The most important river is the Rhine; besides this it contains the heads of the Danube, and the Main, Weser, and Elbe. The pop. in 1890 was 49,428,470, an average of 237 inhabitants per sq. m. This was distributed as follows among the various States comprising the Empire:

| | | |
|---|---|---|
| Prussia, | Kingdom | 29,957,367 |
| Bavaria, | " | 5,594,982 |
| Saxony, | " | 3,502,684 |
| Wurtemburg, | " | 2,036,522 |
| Baden, | Grand Duchy | 1,657,867 |
| Hesse-Darmstadt, | " " | 992,883 |
| Mecklenburg-Schwerin, | " " | 578,342 |
| Saxe-Weimar, | " " | 326,091 |
| Mecklenburg-Strelitz, | " " | 97,978 |
| Oldenburg, | " " | 354,968 |
| Brunswick, | Duchy | 403,773 |
| Saxe-Meiningen, | " | 223,832 |
| Saxe-Altenburg, | " | 170,864 |
| Saxe-Coburg-Gotha, | " | 206,513 |
| Anhalt, | " | 271,963 |
| Schwarzburg-Rudolstadt, | Principality | 85,863 |
| Schwarzburg-Sondershausen, | " | 75,510 |
| Waldeck, | " | 57,281 |
| Reuss-Greiz, | " | 62,754 |
| Reuss-Schleiz, | " | 119,811 |
| Schaumburg-Lippe | " | 39,163 |
| Lippe, | " | 128,495 |
| Lubeck, | Free City | 76,485 |
| Bremen, | " | 180,443 |
| Hamburg, | " | 622,530 |
| Alsace-Lorraine, | Imperial Territory | 1,603,506 |

The cultivated land comprises ab. half the area of the empire. Cereals are largely cultivated, also potatoes, hops, and the vine. The manufactures are very extensive and varied. The mineral product is very large, mainly coal, iron and zinc, that of coal reaching ab. 50,000,000 tons annually. The value of imports is annually ab. $950,000,000; of exports $800,000,000.

The present German empire was constituted in 1871, by the union of the above States, with the King of Prussia as its Emperor. It is in form a hereditary limited monarchy, with a legislative body known as the Reichstag, whose members are elected by the people. The standing army numbers 19,262 officers and 468,409 men. The navy comprises 230 vessels, of which 141 are torpedo craft. In 1892 the Funded Debt was 1,685,567,400 marks and the Unfunded 120,000,000 marks. Berlin is the capital and chief city.

*History.*—On the division of the Carlovingian Empire, 840, Louis the German had the e. portion. The Saxon dynasty succeeded, 919–1024. Henry I., 919–936, sought unity and strength for the empire, checked barbarian inroads, and spread Christian institutions. Otho I., 936–973, followed the same policy, till the idea of the Holy Roman Empire drew his attention to Italy. This dynasty ended with Henry II. Conrad II., 1024–39, founded the Franconian line, by which imperial authority was at first strongly asserted, but under Henry IV. the vassals recovered power; his quarrels with Gregory VII. began two centuries of confusion and warfare. After Lothaire III., 1125–37, the Hohenstaufen, Conrad III., 1137–52, was chosen. Wars of Guelphs and Ghibellines, and the Crusades, now wasted the strength of G. Frederic I., 1152–90, effected important changes in the relations of the great vassals, but neglected home interests for Italy, where Frederic II. passed most of his life. After a

German National Monument (erected upon the Niederwald, 1883), by J. Schilling.

period of anarchy following the death of Conrad IV., 1254, Rudolf I. of Hapsburg repressed the robber barons. The next 200 years present few points of interest; the imperial title rested henceforth with the House of Hapsburg, which sought the aggrandizement of Austria. Maximilian I. introduced measures promotive of the general welfare. The reigns of Charles V. and Ferdinand I. were disturbed by events following the Reformation, leading to the Thirty Years' War, 1618–48, which left G. depopulated and impoverished. The male line of Hapsburg expired with Charles VI., 1740. The next two reigns are marked by the contest over Maria Theresa's succession to the Austrian throne, her wars with Frederic the Great, and the unsuccessful efforts of Joseph II. at reform. The wars following French Revolution resulted in the humiliation of G. under Napoleon, the formation of the Rhenish Confederation, and the resignation of the imperial crown by Francis II. After the Allied armies had effected Napoleon's downfall, a new German Confederation was formed under Austria's leadership. The Zollverein formed another bond of union. The revolutions of 1830 and 1848 caused much disturbance. The Frankfort Diet, 1848, offered the imperial crown to Frederick William IV. of Prussia, who refused it. The Schleswig-Holstein difficulties and rivalry of Austria and Prussia led to the war of 1866, the triumph of Prussia, and the formation of the North-German Confederation The Franco-German War, 1870–71, resulted in the defeat of the French, and William I. was proclaimed Emperor at Versailles. G. now advanced to the front rank among European nations. The struggle with the papal power in Prussia, and the growth of socialism, mark the succeeding period; the unity of the empire has been strengthened by monetary laws and by the appointment of a Supreme Imperial Tribunal, appointed for each session by the governments of the several States. The legislative functions of the empire are vested in the Emperor, the Bundesrath, and the Reichstag, or Diet. Members of the Diet are elected for 3 years by universal suffrage. The imperial government has supreme control in affairs military and naval, those relating to imperial finances, commerce, posts and telegraphs, and to railways so far as concerns the common defense. The executive power belongs to the Emperor, who can declare war, if defensive, but for declaring offensive war needs the consent of the Bundesrath. The Bundesrath and Reichstag meet in annual sessions, convoked by the Emperor, who can prorogue the council for 60 days, or dissolve it. All laws must have a majority of votes in both Houses. The Bundesrath is presided over by the Chancellor of the empire. Imperial measures must receive the Emperor's sanction to become law. Members of the Bundesrath are entitled to be present at deliberations of the Reichstag.

**Germ-Ball.** Spherical mass of spores in a Protozoan cell from which there hatch active young while still in the mother cell. Probably these spores are parasitic, and thus the mother cell is a Host or Nurse.

**Germ-Bands.** Two lateral halves of the ventral plate or blastoderm of insects, worms, mollusks, etc.

**Germ-Cell.** Female reproductive cell of any kind.

**Germ-Disease.** One caused by presence of germs in the body as parasites locally or in the blood. Here belong all fevers epidemic and endemic, and most chronic diseases, such as cancer, syphilis, consumption, leprosy. A fever is the reaction of the nervous system from the poison produced by the germs, and may also have for its object the attenuation of virulence of the germ. Usually the poison is excreted; hence the value of perspiration in fevers. Drugs that act simply to prevent the nervous system from producing fever while leaving the bacterial poison in the system must be considered as dangerous medicines. See DISEASE GERMS.

**Germersheim.** Town of Bavaria, 8 m. s.w. of Spires. Here the French under Beauharnais were defeated by the Austrians under Wurmser, July 19 and 22, 1793. Pop. 6,132.

**Germinal.** "Budding," seventh month of the French Revolutionary Calendar; it included March 21 to April 19.

**Germinal Disk.** Lens-shaped aggregation of protoplasm, which separates from the yolk of fish eggs after impregnation, and undergoes segmentation to form the blastoderm.

**Germinal Dot** (or SPOT). Egg nucleolus; body inside the germinal vesicle.

**Germinal Membrane.** The blastoderm.

**Germinal Plasm.** That part of the protoplasm, especially of the chromatin, which develops into the germ or embryo in eggs.

**Germinal Ridge.** Embryonic ridge of cells destined to become the ovaries or testes. It lies in the dorsal wall of the body cavity of vertebrate embryos.

**Germinal Streak.** See PRIMITIVE STREAK.

**Germinal Vesicle.** Egg nucleus; the body which contains the germinal plasm, and unites with the spermatozoön at fecundation.

**Germination.** Sprouting of seeds, induced by the requisite conditions of temperature and moisture.

**Germinative Pole.** That pole of the egg where the germinal disk, the polar globules, and the first rudiments of the embryo appear; opposed to the vegetative or nutritive pole.

**Germ Stock.** Definite part of the body of polypoid animals, from which budding takes place.

**Germ Theory.** Theory that infectious diseases are produced by micro-organisms which are introduced into the body.

**Gernsheim,** FRIEDRICH, b. 1839. Teacher in Cologne and Berlin; composer of chamber music and choral works in medium forms.

**Gerok,** KARL FRIEDRICH VON, D.D., 1815–1890. German poet, court preacher at Stuttgart 1868. His *Palm Leaves*, 1857, tr. 1869, are extremely popular; 2d series, 1882.

**Gérome,** JEAN LÉON, b. 1824. French painter and sculptor. In sculpture he may claim equality with any modern. His

*Pygmalion and Galatea* was exhibited at the Chicago World's Fair. Among his great pictures may be named *The Death of*

African Hounds (by Gerome).

*Marshal Ney, The Duel after the Ball, The Gladiators,* and *Death of Cæsar.*

**Gerona.** Capital of a province in n.e. Spain; strongly fortified and often besieged; as by the French 1808–9; five times taken. Pop. 15,500.

**Geronimo.** Chief of the Chiricahua Apaches; taken in Arizona, 1886, by Gen. Miles, after many outrages, and sent to Fort Pickens, Fla.

**Gerousia.** The supreme council of elders in Dorian Greek cities. At Sparta it comprised the two kings, who were its presidents, and thirty members.

**Gerry,** ELBRIDGE, 1744–1814. Member of the Continental Congress 1776–80 and 1783–85; signer of the Declaration of Independence; M. C. 1789–93; Envoy to France 1797; Gov. of Mass. 1811–12; Vice-Pres. of U. S. 1813; an anti-Federalist and strong partisan.

**Gerrymander.** Apportioning or combining of election districts in such a way as to favor one political party; named from Gov. Gerry, during whose term Mass. was redistricted. One of the districts was said to resemble a salamander in form.

**Gerson,** JEAN CHARLIER DE, 1363–1429. "Doctor Christianissimus." Chancellor Univ. Paris 1392. He sought reform through Councils, as above Popes, and was prominent at Constance 1414, when he urged the burning of Huss and Jerome. Some think him the author of the *Imitation of Christ.*

**Gerstäcker,** FRIEDRICH, 1816–1872. German traveler and novelist. Most of his books have been translated; they deal largely with American subjects.

**Gerster,** ETELKA (MME. GARDINI), b. 1856. Hungarian singer. She appeared at Venice 1876, and in the U. S. 1878.

**Gervase** OF CANTERBURY, b. ab. 1141. Author of a chronicle extending 1135–1210, pub. 1879–80, and of a history of the Abps. of Canterbury.

**Gervase** OF TILBURY, ab.1155–ab.1235. Marshal of Arles 1208. His *Otia Imperialia,* written ab. 1212 for Otho IV. contains history and other matters.

**Gervex,** HENRI, b. 1848. French painter.

**Gervinus,** GEORG GOTTFRIED, 1805–1871. German historian and expositor of Shakespeare; hon. prof. Heidelberg 1844. His chief works are histories of German Poetry, 5 vols., 1835–42, and of the 19th Century, 8 vols., 1853–66.

**Geryon.** In Greek Mythology, three-headed monster, owner of cattle which Hercules, as his tenth labor, had to convey to Greece.

**Geryonidæ.** Family of *Trachymedusæ,* with cartilaginous mantle ridges and four or six hollow tentacles. The manubrium is long, with a conical proboscis and four or six canals that lead to the radiating canals. The generative organs lie on the radial canals; there are eight or twelve marginal vesicles (otocysts).

**Gesenius,** FRIEDRICH HEINRICH WILHELM, D.D., 1786–1842. German Hebraist, prof. at Halle from 1810. His *Hebrew Lexicon,* 1810–12, and *Grammar,* 1813, have been as much used in English translations as in the original.

**Gesner,** JOHANN MATTHIAS, 1691–1761. Prof. Göttingen 1734; editor of sundry Latin classics. His *Novus Linguæ et Eruditionis Romanæ Thesaurus,* 4 vols., 1749, was long valued.

**Gesner,** KONRAD VON, 1516–1565. Physician and prof. Physics at Zurich from 1541; voluminous writer. *Opera botanica; Historia plantarum,* 1541; *Catalogus plantarum,* 1542; *Bibliotheca Universalis,* 1545–49; *Hist. Animalium,* 6 vols., 1551–58.

**Gesneraceæ.** Natural family of flowering plants, of the class *Angiospermæ,* sub-class *Dicotyledons,* and series *Gamopetalæ,* comprising 82 genera and ab. 900 species, widely distributed throughout the tropics and the regions bordering on them.

**Gessner,** SALOMON, 1730–1787. Swiss poet, painter, and engraver. His prose idyl, *Death of Abel,* 1758, was widely tr. and read.—His son, KONRAD, 1762–1824, was an eminent artist.

**Gesta Romanorum.** Collection of brief Latin tales, dating from ab. 1300; long widely popular; tr. 1577 and 1824.

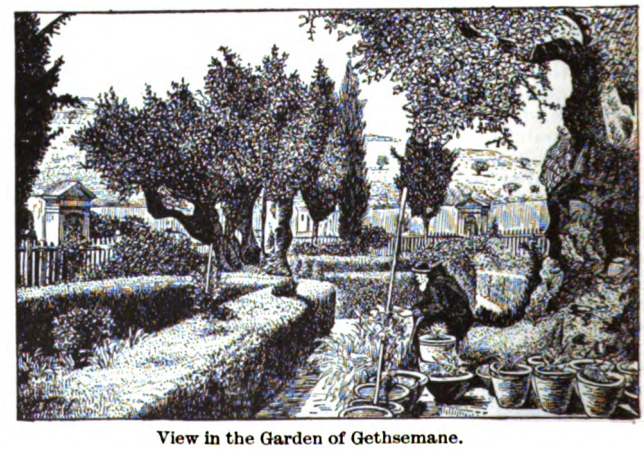
**Gestation.** Period which extends from the impregnation of the ovum to the delivery of a perfect animal; pregnancy. Period of gestation:—Mouse, 24 days; Rabbit and Hare, 32; Rat, 35; Guinea-pig, 49; Cat, 56; Dog and Fox, 63; Pig, 113; Sheep, 147; Goat, 154; Cow, Deer, and Woman, 280; Horse and Camel, 340.

**Geta,** PUBLIUS SEPTIMIUS, 189–212. Younger son of Septimius Severus; Cæsar 198; Augustus 209; Emperor 211 with his brother Caracalla, who murdered him.

Geta.

**Getæ.** Thracian people, called Daci by the Romans; living s. of the Danube in the time of Herodotus, n. of it in that of Alexander; conquered by Trajan 106.

**Gethsemane.** Small olive-farm, including also a garden or orchard, on the lower slopes of the Mount of Olives, just e.



View in the Garden of Gethsemane.

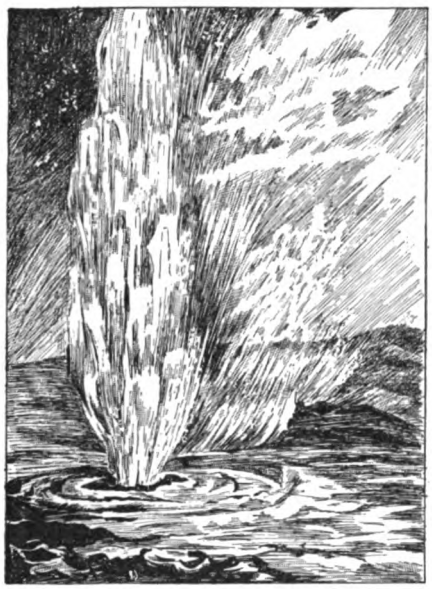
of the Brook Kedron; scene of Our Lord's Agony, on the night before his Crucifixion. The olive-trees now found there are very ancient, but not of that date.

**Gettysburg.** Town of Adams co., Pa.; seat of Pa. Coll. and a Lutheran theol. sem.; scene of the victory of Union forces under Meade, July 1, 2, 3, 1863, over Confederates under Lee, who lost 25,000 out of 70,000 men; Union loss 23,000 out of 80.000. Pop., 1890, 3,221.

**Geulinx,** ARNOLD, 1625–1669. Belgian philosopher, follower of Descartes; noted for his doctrine of preëstablished harmony, and the occasional interference of Deity to keep the two substances, mind and matter, in harmonious relations to each other. *Metaphysica Vera*, 1691; *Ethica*, 1696.

**Gevaërt,** FRANÇOIS AUGUSTE, b. 1828. Belgian composer, musical historian and scholar, notable particularly for a treatise on orchestration, *Nouveau traité d'instrumentation*, 1885, and a study of liturgical song, *Les Origines du Chant liturgique*, opposing the claims of Gregory the Great.

**Geyser.** Thermal springs which either periodically or irregularly throw up large streams of water, often 200 ft. or more. The cause of the eruption is supposed to be due to the heating of the water by lava underground. The most noted



The Strokr Geyser in Iceland, recently extinct.

are the Beehive, Giant, Giantess, and Old Faithful in the Yellowstone Park, and the Great Geyser and Strokr or Churn of Iceland, in which districts they mostly occur. Cones of silicious matter are formed at the mouth.

**Geyserite.** Silicious concretionary deposit that accumulates about the outlets of geysers.

**Gfrörer,** AUGUST FRIEDRICH, 1803–1861. German historian, prof. at Freiburg 1846; R. C. 1853. *Philo*, 1831; *Gustav Adolf*, 1835–37; *Ch. History*, 4 vols., 1841–46; *Carlovingians*, 1848; *Gregory VII.*, 1859–61; *Byzantine History*, 3 vols., 1872–77.

**Ghauts,** or GHÁTS. Ranges of mountains forming the e. and w. borders of the plateau of s. India. Their height ranges from 3,000 to 7,000 ft.

**Ghawazis.** Inferior class of public dancers in Egypt, less respectable than the Almehs.

**Ghazipur.** Town on the Ganges 40 m. from Benares, India, in a very hot and damp district. It is the principal opium depôt of the N.W. Provinces. Pop., 1891, 45,000.

**Ghazni,** GHIZNI, or GHUZNEE. Fortified city of Afghanistan, capital of the Ghasnevide dynasty ab. 950–1186; besieged by Jenghis Khan; bestowed by Timur on a grandson 1401; in possession of Baber and his descendants 1504–1738; captured by the British July 23, 1839; by Afghans March 6, 1842; re-entered by English Sept. 6; seized by Mahomet in Jan. 1880; retaken April 20. Pop. ab. 10,000.

**Ghebers.** See GUEBERS.

**Ghee.** Clarified butter, made principally from buffalo-milk. The natives of India are exceedingly fond of it, but to Europeans it is unpalatable.

**Gheel.** Town of Belgium, 26 m. e.s.e. of Antwerp; noted for its colony of the insane. Pop. 11,000.

**Ghent.** City of Belgium, on the Scheldt, at the mouth of the Lys. It has extensive commerce and manufactures, especially of cotton. It was held successively by the Counts of Flanders, the Dukes of Burgundy, Spain, and Austria. Long turbulent, it revolted under J. and P. Van Artevelde 1345 and 1382, and against Charles V. 1539. The Spaniards took it 1584, the French 1678. Pop., 1891, 150,223.

Ghent—The Corn Quay.

**Ghent,** PACIFICATION OF. Concluded Nov. 8, 1576, between Holland, Zealand, and the southern provinces of the Netherlands against Spain.

**Ghent,** TREATY OF. Between the U. S. and Great Britain, signed Dec. 24, 1814. It reached N. Y. Feb. 11, 1815, and was ratified by the Senate Feb. 17. It provided for exchange of prisoners, restoration of territories gained during the war, adjustment of boundaries, and suppression of the slave trade.

**Gherardesca,** UGOLINO DELLA, d. 1288. Admiral and tyrant of Pisa; for his crimes deposed by a popular uprising, and starved with his children; immortalized by Dante.

**Gherardi,** BANCROFT, U.S.N., b. 1832. Rear-admiral 1887; Director of the naval parade off New York April 26–27, 1893.

**Ghetto.** Quarter of Rome to which Jews were confined 1569–1847. Similar sections were assigned them in other cities.

**Ghibellines.** Those Italians who favored the Empire as against the Papacy, adhering to the Hohenstaufen, from a local epithet of whom the name is derived; opponents of the GUELPHS (q.v.).

**Ghiberti,** LORENZO, 1378–1455. Italian goldsmith and sculptor, who effected a revolution in art by his bronze doors of the Florence Baptistery. Of these there are two pairs, the first dating 1403–25, the second 1425–52. The latter are the first

Panel from the bronze doors of the Baptistery, Florence.

wholly modern works in modern art. The former are also of epoch-making importance, and mark an entire break with the style of the 14th century and of Giotto. The doors are treated in relief panels, with designs in one case from the life of John the Baptist, in the other, from the O. T.

**Ghika,** GEORGE. Hospodar of Wallachia 1657; of Albanian descent. His descendants have often held the highest posts in that region, and are still prominent in Roumania.

**Ghika,** HELENA ("DORA D'ISTRIA"), 1829–1888. Prolific French writer, b. at Bucharest, resident at Florence from 1855; married 1849 to Prince Koltzoff-Massalsky.

**Ghilan.** Persian province bordering on Russia and the Caspian Sea: area 6,000 sq. m. It is densely wooded, has mulberry plantations and rice-fields. Pop. ab. 200,000.

**Ghirlandajo,** DOMENICO, 1449–1494. Florentine painter, next to Massaccio, one of the great leaders of his day, especially in fresco. He has important works in Maria Novella, Florence, and one in the Sistine Chapel at Rome. Michelangelo was for some time an apprentice in his studio.—His son, RIDOLFO, 1483–1561, was an able artist.

**Ghosts.** Souls or spirits of the dead imagined as wandering among living people. A species of apparition of which the reality is much questioned. The belief in ghosts and in their appearance to the senses is however extremely widespread and found in all levels of culture, being characteristic of the savage mind and common in the higher civilizations. The question as to the reality of so-called ghostly apparitions becomes simply one of evidence, and while the weight of the latter is overwhelmingly against the ghosts, it cannot be said to be definitely conclusive, and there still remains a considerable number of intelligent investigators who give in their adherence to a belief in the possibility of at least supernormal, subjective apparitions of dead individuals, if not in the objective reality of such appearances.

**Ghost Dance.** The Messiah Nivoka of the Piutes in Nevada taught his tribe the new religion in 1889, which seeks peace and abandons old ideas. The dance is at night, in full costume, moving in a circle with joined hands and singing of happy days, but not of war. Under hypnotic influences, they communicate with the spirit world. It has been extended to most of the tribes.

**Ghoul.** According to Persian superstition, a fair woman of ab. 20 years of age that preys by night on corpses. The Ghoul or Demons of the Desert are also a hideous race, haunting cemeteries and particularly infesting a dreary tract in n. Persia called the Valley of the Angel of Death. See VAMPIRE.

**Gianibelli,** FEDERIGO, b. ab. 1530. Italian military engineer, who, neglected by Philip II., turned against Spain, helping the Dutch at Antwerp 1585, and the English with fortifications and fire-ships 1588.

**Gianni,** LAPO, ab. 1300. Italian poet.

**Giannone,** PIETRO, 1676–1748. Italian historian. His valuable *Civil Hist. Kingdom of Naples*, 4 vols., 1723, caused his excommunication and exile; for *Il Triregno*, 1735, he was imprisoned till his death.

**Giannotti,** DONATO, 1492–1573. Italian political writer and dramatist. *Venice*, 1530; *Florence*, 1527–31; *Italy*, 1535.

**Giant Powder.** Dynamite in which the chemically inactive absorbent is kieselguhr. There are many grades in which the proportion of nitroglycerine varies from 20 to 75 per cent. Giant powder No. 2 consists of 40 parts nitroglycerine, 40 of potassium nitrate, 6 of sulphur, 6 of rosin and 8 of kieselguhr.

**Giants.** In Greek mythology, offspring of the blood-drops that fell from the mutilated Uranus upon the earth, so that Earth was their mother. Armed with rocks and trunks of trees, they assailed Heaven, but were destroyed by the gods with the aid of Hercules, and buried under Ætna and other volcanoes.

**Giant's Causeway.** Headland of columnar basalt in

Giant's Causeway.

Antrim, Ireland, 15 m. n.e. of Coleraine. There are ab. 40,000 pillars of diameter from 15 to 30 in. stretching in three steps 900 ft. into the sea. Its name comes from the legend that it was the work of giants who commenced a bridge to Scotland.

**Giaour.** Term applied by Mohammedans to all men of a different faith. It answers to Gentile as used by Jews.

**Gib,** or COTTER. Wedge-shaped piece of metal used to tighten or adjust a contact of two other surfaces; used in three ways or senses. 1. As a plain taper wedge or key, driven into a rectangular slot in a rod or stud, and bearing against the slot on its one side and against the flange or piece to be secured on its other. 2. In connection with a taper key in stub-ends and cases of that sort, where two elements are to be drawn together by a pull parallel to a given axis. Then the one side of the gib and one side of the key have equal taper toward an axis, the other sides respectively being parallel to that axis. When the key is driven past the gib, the space between their parallel sides is altered, and the connected parts move accordingly. 3. Those adjustable elements by which the wear or lost motion of sliding organs is taken up. These are either wedges of the shape of an inclined plane, which are drawn in against a complementary inclined surface by an adjusting screw, or else they are without taper and are adjusted parallel to themselves by set-screws as wear occurs.

**Gibbet.** Framework erected usually on the scene of a crime on which the executed criminal was suspended as a warning to other malefactors.

**Gibbon** (APE). See HYLOBATES.

**Gibbon,** CHARLES, 1848–1890. Scottish novelist. *Auld Robin Gray*, 1869; *For Lack of Gold*, 1871; *Life of George Combe*, 1878. He wrote ab. 30 books.

**Gibbon,** EDWARD, 1737–1794. English historian; M. P. 1774–82. His great work, the *Decline and Fall of the Roman Empire*, was conceived 1774 and completed 1787. Vol. I. was pub. 1776, II., III., 1781, IV., V., VI., 1788. It holds an undisputed place as a great English classic; its swelling style fits the dignity of the subject, and its reflections on Christianity have been neutralized by the notes of Milman, Guizot, and other editors.

**Gibbons,** GRINLING, 1648–1721. English wood-carver, preeminent in this art; b. in Holland. His work is found in St. Paul's, in the Chapel Royal, at Canterbury, at Petworth, and elsewhere. He was also a sculptor, and left some good statues.

**Gibbons,** JAMES, D.D., b. 1834. Bp. of Richmond 1872; Abp. of Baltimore 1877; Cardinal 1886. His *Faith of Our Fathers*, 1874, was very widely circulated. *Our Christian Heritage*, 1889.

**Gibbons,** JAMES SLOAN, 1810–1892. Author of the war-song, *We are Coming, Father Abraham:* father of the agitation resulting in Arbor Day. *Banks of New York*, 1857; *Public Debt*, 1867.—His wife, ABIGAIL (HOPPER), 1801–1893, was active in reforms.

**Gibbons,** ORLANDO, Mus.Doc., 1583–1625. Organist of the Chapel Royal 1604, of Westminster Abbey 1623; composer of anthems, hymns, tunes, and madrigals.

**Gibbons,** THOMAS, D.D., 1720–1785. Minister in London from 1743. *Calvinism*, 1740; *Female Worthies*, 1777; *Hymns*, 1769–84.

**Gibbous.** That phase of the moon or a planet when the illuminated part seen from the earth is greater than a semicircle and less than the full circle.

**Gibbs,** GEORGE, 1776–1833. One of the earliest promoters of the study of mineralogy in the U. S.—His son, GEORGE, 1815–1873, wrote much on Indian languages, chiefly for the Smithsonian publications.

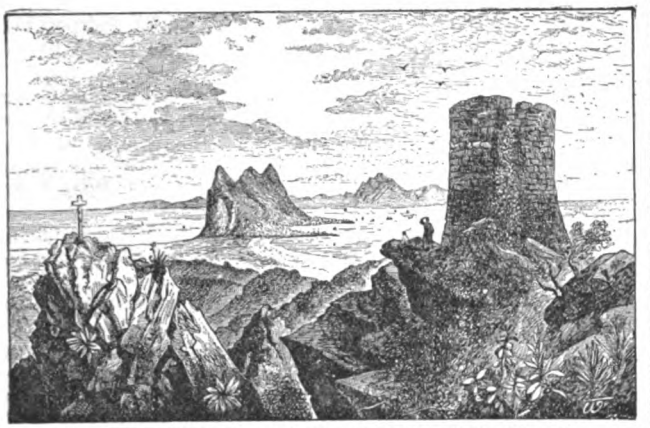
**Gibbs,** WOLCOTT, M.D., LL.D., b. 1822. Son of George; prof. of Chemistry Coll. of the City of New York 1849–63, and Harvard 1863; author of many monographs in the *Journal of Science and Arts*.—His brother, ALFRED, U.S.A., 1823–1868, was Brig.-gen. of Vols. 1864–66.

**Gibbsite.** $H_6Al_2O_6$. Aluminium hydrate, often associated with corundum and with limonite.

**Gibeonites.** Canaanites of Gibeon, 5 m. n.w. of Jerusalem, who by adroitness saved themselves from extermination by the Israelites, but were made subject to the menial services of the tabernacle and temple.

**Gibraltar.** Rock, town, and almost impregnable fortress upon the s. point of Spain, belonging to England. The rock rises abruptly to a height of 1,467 ft. and is connected with the mainland by a low isthmus. The fortifications have in the main been excavated in the rock. It was taken by Spain 1309;

by the Moors 1333; again by Spain 1462; by England 1704. The last of many sieges was that by France and Spain 1779–83.



The Rock of Gibraltar; from the "Queen of Spain's Chair."

Civil population, of several races, ab. 19,000; garrison ab. 6,000.

**Gibraltar Stone.** Stalagmitic calcite, found in a cavern at Gibraltar, resembling the so-called oriental alabaster.

**Gibraltar,** STRAITS OF. Passage connecting the Mediterranean with the Atlantic and separating Europe from Africa. At its narrowest point it is but 12 m. wide and shallow as compared with the sea on either side.

**Gibson,** CHARLES DANA, b. 1867. American artist and illustrator.

**Gibson,** EDMUND, D.D., 1669–1748. Bp. of Lincoln 1716, London 1720; polemic and antiquarian writer; tr. Camden's *Britannia*.

**Gibson,** JOHN, 1790–1866. Sculptor, pupil of Canova and Thorwaldsen, best English representative of the Greek Revival style; first modern to attempt tinted statues, in imitation of the Greek method. His *Cupid Disguised as a Shepherd* is in the N Y. Metropolitan Museum of Art.

**Gibson,** JOHN MONRO, D.D., b. 1838 in Scotland. Presb. pastor in Montreal 1864–74, Chicago 1874–80, and in London since 1880. *Ages before Moses*, 1879; *Foundations*, 1880; *Mosaic Era*, 1881; *Christianity*, 1888.

**Gibson,** RANDALL LEE, 1832–1892. M. C. from La. 1875–83; U. S. Senator from 1883.

**Gibson,** THOMAS MILNER, 1806–1884. M. P. 1837–39, 1841–68; Pres. Board of Trade 1859–66.

**Gibson,** WILLIAM, M.D., LL.D., 1788–1868. Prof. Univ. Pa. 1819–55. *Surgery*, 1824.

**Gibson,** WILLIAM HAMILTON, b. 1850. American artist, illustrator, and author of descriptive books, as *Pastoral Days*, 1881; *Our Edible Toadstools*, 1895.

**Gid.** Disease of sheep, usually of those less than two years old, in which a staggering gait, vertigo, and an inclination to walk in a circle, are the most prominent symptoms, and due to the presence in the brain of the bladder-worm or hydatid (*Cœnurus cerebralis*) of a tape-worm, *Tœnia cœnurus*, found in the dog. May be relieved by injecting iodine into the hydatid, which is indicated by a soft spot on the head.

**Giddiness.** See VERTIGO.

**Giddings,** FRANKLIN HENRY, b. 1855. Prof. Bryn Mawr 1888, and Columbia 1894: writer on economics and sociology.

**Giddings,** JOSHUA REED, 1795–1864. M. C. from Ohio 1839–59; censured by the House 1842 for opposition to slavery, in which he never wavered; thrice assaulted; Consul-gen. in Canada from 1861. *Pacificus*, 1843; *Speeches*, 1853; *Exiles of Florida*, 1858; *The Rebellion*, 1864.

**Gideon.** Fifth judge of Israel, who overthrew the Midianites, and ruled ab. 1249–1209 B.C.

**Gien.** French town on the Loire, 32 m. from Orleans, with manufactures of pottery, and corn and wine trade. Pop., 1890, 6,833.

**Giers.** See DE GIERS.

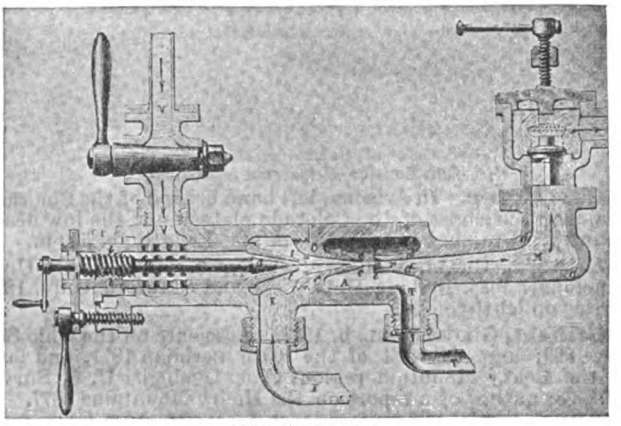
**Giesebrecht,** WILHELM VON, 1814–1889. Prof. Königsberg 1857, Munich 1862. *Geschichte der Deutschen Kaiserzeit*, 5 vols., 1855–80; *Arnold von Brescia*, 1873.

**Giesecke,** KARL LUDWIG VON, 1761–1833. Prof. Mineralogy at Dublin 1813.

**Gieseler,** JOHANN KARL LUDWIG, D.D., 1792–1854. Prof. Bonn 1819, Göttingen 1831. His *Ch. History*, 1823–57, is valued chiefly for its notes, but has been tr. thrice.

**Giessen.** University and manufacturing town, on the Lahn in Hesse-Darmstadt, Germany. Univ. was founded 1607. LIEBIG (q.v.) was prof. here. Pop., 1890, 20,400.

**Giffard's Injector.** Apparatus by which a steam boiler is supplied with water by the direct action of its own steam pressure. Steam from the boiler enters the apparatus through a lateral opening, and the water through a similar opening on the other side, a little in advance. Several ingenious devices



Giffard's Injector.

on the inside enable the energy of the steam to communicate sufficient velocity to the water to raise a small valve and force itself into the boiler. The force of the steam acts on the water for a considerable distance, while the distance through which the valve is lifted is very small.

**Giffen,** ROBERT, b. 1837. Scottish journalist and political economist; Chief of Statistical Dept. of Board of Trade 1876–81. *Essays on Finance*, 1879–86.

**Gifford,** ROBERT SWAIN, b. 1840. N. A. 1878. American landscape painter. His *Sea-Weed Gatherers* was exhibited at the World's Fair, Chicago. He is also eminent as an etcher, and has produced many plates of the sandy, wind-swept scenes around his native Buzzard's Bay.

**Gifford,** SANDFORD ROBINSON, 1823–1880. N. A. 1854. American landscape painter.

**Gifford,** WILLIAM, 1756–1826. English critic and satirical poet; ed. *Anti-Jacobin*, 1797–98, and *Quarterly Review*, 1808–24; a fierce Tory, who carried politics into literature, after the evil fashion of that day, and malignantly pursued Keats and Leigh Hunt as Liberals. His *Baviad* and *Mœviad*, 1794–96, demolished the Della Cruscans and other offenders. He tr. Juvenal 1802, and ed. Massinger 1805, and Ben Jonson 1816.

**Gift.** Transfer of property by delivery of possession without consideration. It may be contingent upon the death of the donor; if not, it is irrevocable, unless obtained by fraud or undue influence, or prejudicial to creditors.

**Gigantostraca** (or PALÆOCARIDA). Grand division of *Crustacea*, including the *Pœcilopoda*, Trilobites, and *Merostomata*, which are by some considered as properly belonging with the Arachnids. These forms possess one pair of appendages in front of the mouth, but supposed to properly be postoral in origin. The walking legs are on an unsegmented cephalothorax, and surround the mouth, their basal joints being adapted for mastication. The abdomen ends in a flat or a spine-like telson.

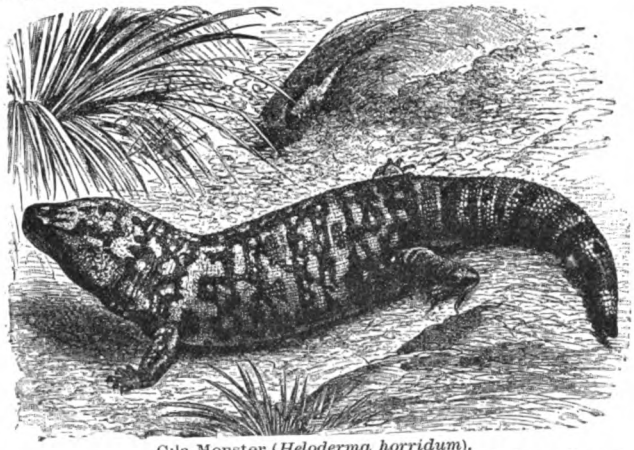
**Gignoux,** FRANÇOIS RÉGIS, 1816–1882. French landscape painter, in Brooklyn, N. Y., 1844–70.

**Gigue.** Italian *Giga*, English *Jig*. Lively dance in triple time, though sometimes noted in $\frac{4}{4}$ time with four groups of triplets in a measure. It did not appear in artistic music before 1650, and continued to be used as a movement in the Suite till ab. 1780. It is probably of Celtic origin.

**Gijon.** Spanish port, on the Bay of Biscay. It has fisheries and blast furnaces and is a coal center. Pop., 1887, 35,200.

**Gila Monster.** Name commonly given to *Heloderma suspectum*, one of the largest lizards of N. America, found in the deserts of s.w. U. S. *Heloderma horridum* is closely related.

Its bite is rapidly fatal to small animals though rarely to man. The poison is alkaline and affects the heart.



Gila Monster (*Heloderma horridum*).

**Gila River.** In Arizona, left hand branch of the Colorado, draining the slopes of the Colorado plateau and the low desert country. Drainage area 68,623 sq. m. Length ab. 500 m.

**Gilbert,** CHARLES HENRY, Ph.D., b. 1859. Prof. Univ. Cincinnati 1884, Indiana Univ. 1888, and Stanford Univ. 1891; writer on ichthyology.

**Gilbert,** GROVE KARL, b. 1843. Associate on the Ohio Survey 1869; engaged west of the 100th meridian 1871, and later in the Rocky Mountain region; Chief Geologist U. S. Survey 1879-93; author of a report on the Henry Mountains 1877.

**Gilbert,** SIR HUMPHREY, 1539-1583. English adventurer and discoverer, half-brother of Sir Walter Raleigh. Under patent from Elizabeth he sailed 1578 and 1583 to take possession of northern parts of America, and on his second return voyage was lost.

**Gilbert,** SIR JOHN, b. 1817. English painter and illustrator, addicted to subjects of chivalry; knighted 1872; R.A. 1876.

**Gilbert,** JOHN GIBBS, 1810-1889. American actor, eminent in such parts as *Sir Anthony Absolute* and *Sir Peter Teazle.*

**Gilbert,** JOHN THOMAS, b. 1829. Irish historian.

**Gilbert,** SIR JOSEPH HENRY, b. 1817. English agricultural chemist, since 1843 connected with SIR J. B. LAWES (q.v.) in the Rothamsted experiments, and director of the chemical work; prof. Oxford 1884.

**Gilbert,** WILLIAM, 1540-1603. Physician to Elizabeth; a scientific investigator far in advance of his time. His *De Magnete*, 1600, regards the earth as a magnet and introduces electricity and cognate terms. *De Mundo nostro*, 1651.

**Gilbert,** WILLIAM SCHWENCK, b. 1836. English humorist and poet. Except in the *Bab Ballads*, 1868-70, which were aided by his own illustrations, he has used the dramatic form. *Pygmalion and Galatea*, 1871, and other plays have been collected in 2 vols. His comic operas, *H.M.S. Pinafore*, 1878, *Pirates of Penzance*, 1880, *Patience*, 1881, *The Mikado*, 1885, etc., with Sir Arthur Sullivan's music, attained immense success.

**Gilbertines.** Orders founded in England 1135-48 by St. Gilbert of Sempringham; suppressed at the Reformation. The monks were Augustinians, the nuns Benedictines, the lay brothers Cistercians.

**Gilbert** (or KINGSMILL) **Islands.** Sixteen atolls in the

King Paul's House at Butaritari, Gilbert Islands.

Pacific, about the equator, long. 171°-177° E.; discovered by Commodore Byron in 1765 and again by Captains Gilbert and Marshall 1788; annexed by the British 1892. Area 166 sq. m.; pop. ab. 25,000, including less than 100 Europeans.

**Gilbertus Porretanus,** 1070-1154. Bp. of Poitiers 1142; noted as a logician and theologian; accused of heresy by Bernard. *De Sex Principiis.*

**Gilboa.** Hill in Palestine between Esdraelon and the Jordan, where Saul and his three sons were slain by the Philistines.

**Gilchrist,** ALEXANDER, 1828-1861. Biographer of Etty, 1855. His *Life of Blake*, 1863, was completed by his widow, ANNE (BURROWS), 1828-1885, who wrote a *Life of Mary Lamb*, 1883.

**Gilchrist,** WILLIAM WALLACE, b. 1846. American musician. His *46th Psalm* took the prize of $1,000 at the Cincinnati Festival, 1882.

**Gildas,** ab. 516-570. Monk of Bangor; historian of the Britons to his own time.

**Gilder,** RICHARD WATSON, LL.D., b. 1844. American poet, ed. *Century Magazine* since 1881.—His sister, JEANNETTE LEONARD, and brother, JOSEPH B., edit the N.Y. *Critic*. Another brother, WILLIAM HENRY, b. 1838, has narrated his Arctic explorations in *Schwatka's Search*, 1881, and *Ice-pack and Tundra*, 1883.

**Gildersleeve,** BASIL LANNEAU, LL.D., b. 1831. Prof. Univ. Va. 1856-76, and since at Johns Hopkins; ed. *Journal of Philology* since 1880, and several Latin text-books.

**Gilding.** Covering a substance with a gold layer. The oldest is by laying on gold-leaf, but electro-plating is now employed; the article to be plated is suspended in a solution of cyanide of gold and connected with the negative pole and a piece of gold in the solution with the positive pole. Porcelain is gilded with gold powder and turpentine, baked in a muffle, and polished.

**Gilead.** Mountainous region e. of Jordan, held by the Amorites and Og of Bashan; assigned on the Jewish conquest to Reuben, Gad, and Manasseh.

**Giles,** ST., ab. 640-720. Greek founder of a monastery in s.e. France; patron of cripples; honored Sept. 1.

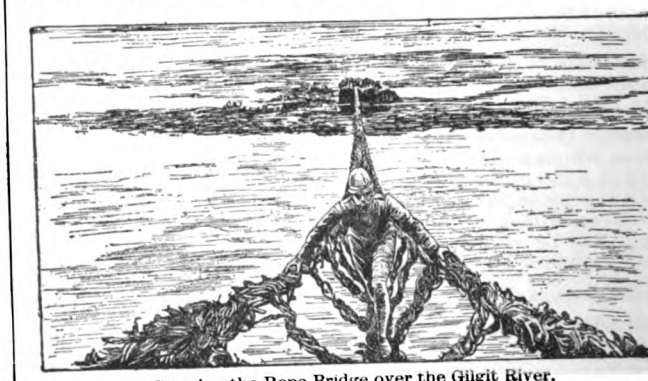
**Giles,** CHAUNCEY, b. 1813. Swedenborgian pastor in Phila.; prolific writer.

**Giles,** HENRY, 1809-1882. Irish lecturer and essayist, in the U. S. from 1840.

**Giles,** WILLIAM BRANCH, 1762-1830. M. C. 1791-99, 1801-3; U. S. Senator 1804-15; Gov. of Va. 1827-29.

**Gilfillan,** GEORGE, 1813-1878. Scottish author, Minister at Dundee from 1836. *Literary Portraits*, 1845-49-54; *Bards of the Bible*, 1850; *Martyrs of the Covenant*, 1852; lives of Sir W. Scott and Dr. W. Anderson, 1870-73.

**Gilgit.** Town in Cashmere, India, 130 m. n.w. of Svinagar, on a river of the same name tributary to the Indus. Mountain



Crossing the Rope Bridge over the Gilgit River.

roads to Chitral render its position of some importance. Pop., 1895, ab. 4,500.

**Gill.** Liquid measure containing one-fourth an Imperial pint, 8.66 cubic in. U. S. gill contains 7.22 cubic in.

**Gill.** *Glecoma hederacea.* Creeping herb of the Mint family, native of Europe, introduced into N. America: known also as Ground Ivy.—In Mycology, plates of tissue bearing the spores on the lower side of the cap in *Hymenomycetes.*

**Gill,** DAVID, b. 1843 in Scotland. Astronomer Royal at Cape Town 1881; Pres. Meteorological Commission of Cape Colony.

**Gill,** JOHN, D.D., 1697-1771. English commentator. Besides an *Exposition* of the Bible, 9 vols., 1746-63, he wrote *Cause of God and Truth*, 4 vols., 1735-38, and a *Body of Divinity*,

1769–70.—His descendant, THOMAS HORNBLOWER, b. 1819, has pub. *The Papal Drama*, 1866, and nearly 200 hymns, collected as *The Golden Chain of Praise*, 1869. Many of these are in use.

**Gill,** THEODORE NICHOLAS, M.D., b. 1837. Prof. of Zoölogy in Columbian Univ. 1887; writer on the Families of Mollusks, 1871, of Mammals, and of Fishes, 1873; contributor to the Smithsonian publications.

**Gill Clefts** (or SLITS). Openings into the œsophagus in the neck of fishes and embryos of higher vertebrates, between the branchial arches.

**Gillem,** ALVAN CULLEM, U.S.A., 1830–1875. Brig.-gen. of Vols. 1863–66, serving in Tenn.

**Gillespie,** GEORGE, 1613–1648. Pastor at Edinburgh 1642; sent to Westminster Assembly 1643. *Aaron's Rod Blossoming*, 1646.

**Gillespie,** WILLIAM MITCHELL. 1816–1868. Prof. Union Coll. 1845. *Roads and Railroads*, 1845; *Land Surveying*, 1855; *Leveling, Topography, and Higher Surveying*, 1871.

**Gillett,** EZRA HALL, D.D., 1823–1875. Prof. Univ. N. Y. 1870. *Life of Huss*, 1863; *Hist. Presbyterian Ch. in U. S.*, 1864.

**Gillies,** JOHN, D.D., 1712–1796. Minister in Glasgow from 1742. *Hist. Collections*, 1754; *Life of Whitefield*, 1772; *Prophecies*, 1773.

**Gillies,** JOHN, LL.D., 1747–1836. Scottish historian. His *Ancient Greece*, 1786–1810, now superseded, was once popular.

**Gilliflower.** Several showy-flowered herbs of the Mustard family, natives of Europe; cultivated for ornament.

**Gilliss,** JAMES MELVILLE, U.S.N., 1811–1865. Organizer of the Naval Observatory 1842–45; author of many astronomical reports and papers.

**Gillmore,** QUINCY ADAMS, U.S.A., 1825–1888. Engineer who planned and directed the works which effected the reduction of Fort Pulaski 1862, and conducted the operations against Charleston, capturing Fort Wagner and demolishing Fort Sumter 1863–64; author of works on engineering, etc.

**Gillray,** JAMES, 1757–1815. English caricaturist, whose plates, "etched on copper without drawings," number 1,200, and follow the political history of 1779–1811. They are coarse but effective, and had much influence.

**Gills.** Found in those water-breathing animals whose bodies are too large to allow of ready interchange of the respiratory gases. They consist of expansions of the skin, well supplied with blood-vessels. Bivalves have four leaf-like gills along the ventral side of the body. In fishes and larval amphibia they are on arches separated by slits in the throat. In *Crustacea* they grow from the proximal joint of the legs. Aquatic larvæ of insects have special expansions of the tracheæ; and tufts on the back are developed on various worms, mollusks, etc.

**Gilman,** ARTHUR, b. 1837. Executive officer of the Harvard Annex from its inception 1876; author or editor of many books, chiefly historical.

**Gilman,** CHANDLER ROBBINS, M.D., 1802–1865. Prof. Coll. Physicians and Surgeons, N. Y., from 1841.

**Gilman,** DANIEL COIT, LL.D., b. 1831. Prof. Yale 1856; Pres. Univ. Cal. 1870; Pres. Johns Hopkins Univ. since 1875. *Monroe*, 1883.

**Gilman,** JOHN TAYLOR, 1753–1828. Treasurer of N. H. 1783–92; Gov. 1794–1805 and 1813–16.—His brother, NICHOLAS, 1755–1814, was M. C. 1789–97, and U. S. Senator from 1805.

**Gilman,** NICHOLAS PAINE, b. 1849. Prof. Antioch Coll. 1878–81; ed. *Literary World*, 1888–95; *Profit-Sharing*, 1889; *Socialism*, 1892.

**Gilman,** SAMUEL, D.D., 1791–1858. Unitarian pastor at Charleston, S.C., from 1819. *New England Village Choir*, 1829.—His wife, CAROLINE (HOWARD), 1794–1888, wrote many tales and poems. *Recollections*, 1835–36.

**Gilmore,** JAMES ROBERTS ("EDMUND KIRKE"), b. 1823. American author. *Among the Pines*, 1862; *On the Border*, 1864; *Life of Garfield*, 1880; *Rear-guard of the Revolution*, 1886; *John Sevier*, 1887.

**Gilmore,** JOSEPH ALBREE, 1811–1867. Gov. of N. H. 1863–65.

**Gilmore,** PATRICK SARSFIELD, 1829–1892. Irish-American bandmaster; organizer of several festivals, director of many concerts, and composer of several songs and marches.

**Gilpin,** BERNARD, 1517–1583. English reformer, priest, "Apostle of the North." He was in constant danger in Mary's reign, and declined a bishopric under Elizabeth.

**Gilpin,** WILLIAM, 1724–1804. English descriptive writer and illustrator. *Highlands of Scotland*, 1778; *River Wye*, 1782; *Lake Country*, 1789; *Forest Scenery*, 1791; *West of England and Isle of Wight*, 1798.

**Gilsonite.** Asphaltic mineral, found in Utah; also known as Uintahite.

**Gil Vicente,** 1485–ab. 1557. Dramatist, called the Portuguese Plautus. His first compositions were the so-called *Autos;* subsequently he wrote comedy and tragi-comedy, in all 42 plays.

**Gimbals.** Two circular brass bands in which the compass box is suspended so that it may retain a horizontal position no matter how the ship swings.

**Gimp.** Twist or edging made of silk, wool, or cotton. A fine wire is woven into the cord to stiffen it.

**Gin.** Portable hoisting apparatus, consisting of framework to which a block and fall can be attached. See WHIM.

**Gin.** GENEVA (JUNIPER). Alcoholic liquor made in Holland and England. So-called Hollands is from a mash at 162° F. of 112 lbs. malted barley and 228 lbs. rye in 500 gallons water. One gal. yeast is added at 80° F., and after two days' fermentation it is distilled for low wines. One-third the sugar remains undecomposed. The low wines, after the addition for flavoring of Juniper berries, hops, and salt, are redistilled for gin. Schiedam, made in the town of that name in Holland, having 200 gin distilleries, omits the hops, 2 lbs. Juniper berries and ¼ lb. salt being added to 100 gallons of low wines. British gins are obtained by distilling a mixture of low wines and rectified spirits with addition of Juniper berries, corianders, almond cake, angelica root, liquorice, and sometimes cardamons and cinnamon; it has a stronger flavor than the preceding. Common gins consist of alcohol flavored with essential oils and turpentine, grains of paradise and cayenne pepper being added for pungency and sugar for smoothness, and then diluted with water; they contain as low as 22 per cent alcohol and up to 9 per cent sugar. In Sweden proof spirits are digested with Juniper berries. Hollands and Schiedam contain from 45 to 49 per cent of alcohol by measure and are slightly acid and contain no sugar. Ab. 176,000 gallons were imported into U. S. in 1895.

**Ginckell,** GODART VAN, ab. 1630–1703. Dutch general, who held command for William III. in Ireland, and took Limerick Oct. 1691; Earl of Athlone 1692.

**Ginger.** *Zingiber officinale.* Perennial herb of the natural family *Scitamineæ*, probably native of India; universally cutivated in tropical regions for its fleshy, subterranean stems used as a condiment.

**Ginger-Grass.** *Andropogon nardus.* Large grass, native of India; yielding an essential oil used in perfumery.

**Ginger,** WILD. See ASARABACCA.

**Gingham.** Cotton fabric made of colored yarns, and not dyed or printed in the piece; manufacture introduced from India.

Common Ginger (*Zingiber officinale*): *a*, plant with barren and flowering stems; *b*, a flower; *c*, portion of leafy stem.

**Gingko.** *Gingko biloba.* Tall tree of the natural family *Coniferæ*, bearing fan-shaped leaves and a plum-like fruit; native of Japan, widely planted for ornament; known also as Maidenhair Tree and *Salisburia adiantifolia.*

**Ginglymodi.** See EUGANOIDES.

**Ginguené,** PIERRE LOUIS, 1748–1816. An active agent in the French Revolution, a poet, and a writer on criticism; educated under the Jesuits, and afterward under the secular clergy who succeeded them. *Literary History of Italy*, 9 vols., 1811–24.

**Ginseng.** *Panax quinquefolia.* Aromatic herb of the natural family *Araliaceæ*, native of e. N. America. The root is used by the Chinese as a substitute for the real Ginseng, *Panax schinseng*, held by them in great repute.

Ginseng.

**Gioberti,** VINCENZO, 1801–1852. Italian philosopher and patriot, who advocated the intellectual, not the political, supremacy of the Pope; banished 1833 by the clerical party. He returned 1848 under the liberal

policy of Pius IX. and served in the King's councils. *La Teorica del Soprannaturale*, 1838; *Introduzione allo Studio della Filosofia*, 1839; *Del Primato Civile e Morale degli Italiani*, 1843.

**Gioja,** MELCHIORE, 1767–1829. Italian economist. *New View of the Economic Sciences*, 1815–19; *Merits and Rewards*, 1818; *Philosophy of Statistics*, 1826.

**Giordani,** PIETRO, 1774–1848. Italian author; originally a Benedictine; much persecuted as a liberal: noted for style. His works, all brief and fugitive, were collected in 14 vols., 1854–58.

**Giordano,** LUCA, ab. 1632–1705. Neapolitan painter of brilliant but superficial talent of the decadence period.

**Giorgione,** GIORGIO BARBARELLE, ab. 1477–1511. Venetian painter of first rank. Most of the works attributed to this

Giorgione's Milo of Crotona.

master have been taken from him by recent criticism. The Madonna at Castelfranco near Venice is one of his best wholly authenticated works.

**Giottino** (TOMMASO DI STEFANO), 1324–1356. Florentine painter.

**Giotto,** DI BONDONE, ab. 1266–1336. Florentine painter; first to break with the Byzantine style and to revive Italian fresco; greatest as a wall painter. His chief work is the Bible stories in Santa Maria dell' Arena at Padua. Other important

Marriage of St. Francis to Poverty (Fresco at Assisi).

frescoes are in St. Francis at Assisi, and in Santa Croce at Florence. As an architect, he designed the Campanile of the Florence Cathedral, and as sculptor the reliefs around its base; some of these he executed.

**Giovanni,** SER, d. ab.1380. Florentine novelist. *Il Pecorone*, 1558, a collection of fifty tales.

**Giovanni da Pisa,** 1240–1320. Son of Nicolo; architect and sculptor. His chief works are at Pisa and Naples.

**Gipcière.** Large bag-like purse richly ornamented and ostentatiously worn in the Middle Ages.

**Gippsland.** See VICTORIA.

**Giraffe.** See CAMELOPARDELLIDÆ.

**Giraffe.** Mine car constructed for use on inclined planes in Pa. coal region. See GUNBOAT.

**Giraldes,** ORGAN OF. Rudiment of the upper end of the Wolffian duct in the male: homologous with the hydatid of morgagni of the female. See PARA-EPIDIDYMIS.

**Giraldi,** GIAN BATTISTA CINZIO, 1504–1573. Italian writer of *Novelle* or short tales. *Hecatommithi.*

**Giraldus Cambrensis,** ab.1146–ab.1220. Welsh priest and author, Bp.-elect of St. David's 1176, but never consecrated. His *Topography of Ireland* and *Cambrian Itinerary*, tr. 1806, with other writings, filled 7 vols., 1861–77.

**Girard,** PHILIPPE HENRI DE, 1775–1845. French inventor of a machine to spin flax; miller in Austria 1815, and in Poland 1825.

**Girard,** STEPHEN, 1750–1831. French merchant in Phila. 1769, trading with W. Indies; banker 1812. His habits were miserly, but he rendered great services to the U. S. in the War of 1812, and devoted most of his immense fortune to charity.

**Girard College.** In Philadelphia; founded by the will of Stephen Girard; opened 1848. The original bequest was $8,000,000; the productive fund now exceeds $12,000,000. The college building, begun in 1833, is a fine example of Greek architecture. Teachers, 62; students, 1,610. No minister of any sect is allowed to teach in the institution, or even to visit it.

**Girardet,** JEAN, 1709–1778. French painter.

**Girardin,** ÉMILE DE, 1806–1881. Ed. Paris *Presse* 1836–56; Deputy from 1848; Senator 1870; a brilliant and influential writer and politician, of little stability. *Questions de mon Temps*, 12 vols.,1858.—His wife, DELPHINE (GAY), 1805–1855, wrote plays, novels, and poems. Her *Lettres Parisiennes*, 1836–48, were signed "Vicomte de Launay." Works, 6 vols., 1860–61.

**Girardin,** FRANÇOIS AUGUSTE SAINT-MARC, 1801–1873. French critic, prof. at the Sorbonne 1831, Academician 1844. *Dramatic Literature*, 1843; *Renaissance*, 1862.

**Girasol.** Bluish-white, translucent opal, showing red reflections when turned toward the sun.

**Girasole.** See ARTICHOKE, JERUSALEM.

**Giraud,** GIOVANNI, COUNT, 1776–1834. Italian dramatist.

**Girder.** Truss of a bridge, or large beam; more usually trusses whose span is less than 100 feet; or solid beam like plate girders, composed of a web and flanges riveted together. A box girder has two webs.

**Girdle.** In the study of diatoms, overlapping edge of one valve over the other.

**Girgenti.** Site of the ancient Agrigentum, a Greek town on s. coast of Sicily. There are ruins here of three Greek temples, the finest being the so-called Temple of Concord. Pop. 21,300.

**Girgeh.** Town containing the oldest R. C. monastery in Egypt. It has only existed since the Christian Era and was

A Slave Boat at Girgeh.

formerly of great importance. It is situated ab. 110 m. s. of Thebes on the left bank of the Nile, into which it is rapidly disappearing. Pop., 1891, 14,819.

**Girnar.** Sacred mountain 3,500 ft. high, 230 m. n.w. of Bombay, India. On it are several Jain temples.

**Gironde.** River of s.w. France, formed by the junction of the Garonne and Dordogne at Bordeaux.

**Girondists.** Moderate republicans of the French Revolution; so named because their earliest leaders came from the department of the Gironde. At first the ruling party, they were overthrown by the Montagnards 1793. Thirty-one of them were arrested July 2; twenty-one were guillotined Oct. 31, and many later.

**Girton College.** At Girton, near Cambridge, England; founded 1869 for the education of women. Instruction is given in part by members of Univ. Cambridge. Students are admitted to the examinations of the university and receive certificates, but not degrees.

**Gisarme.** Powerful scythe-shaped, long-handled weapon, used by infantry in the 14th and 15th centuries.

**Gismondi,** CARLO GIUSEPPE, 1762–1824. Italian mineralogist.

**Gitiadas,** 6th century B.C. Spartan architect and worker in bronze.

**Gitschin.** Bohemian town 50 m. n.e. of Prague, scene of a defeat of the Austrians by the Prussians 1866. Pop., 1890, 8,457.

**Giudici,** PAOLO, 1812–1872. Sicilian, prof. Pisa 1849–64; historian of Italian literature and art.

**Giuliani,** GIAMBATTISTA, 1818–1884. Prof. Genoa 1846, Florence 1860; writer on Dante and the *Divina Commedia.*

**Giulio Romano** (G. DEI GIANUZZI), 1492–1546. Italian painter, leading scholar of Raphael. He completed or colored several of that master's works; *e.g.*, the whole lower portion

Dance of Apollo and the Muses (Pitti Gallery), by Giulio Romano.

of the Transfiguration. His importance declines after Raphael's death, his later work tending to coarseness in quality and thought. Of this time are his frescoes in the Palazzo del Te at Mantua.

**Giurgevo.** Town of Roumania, on the Danube; scene of numerous contests in the Turkish wars. The Russians were defeated here by the Turks July 7, and repulsed July 23, 1854. Pop. ab. 21,000.

**Giusti,** GIUSEPPE, 1809–1850. Italian poet, noted for his patriotic and satirical songs.

**Gizeh,** or GEEZEH. Site naming the largest Egyptian pyramids, 5 m. from it. The Museum of this name was originally

The Ferry at Gizeh.

in the Cairo suburb of Boulak; it was founded by Mariette, and is the most important center of Egyptian antiquities.

**Gizzard.** Muscular division of the stomach in birds and some Invertebrates, for triturating the food. In the earthworm it is in the 18th segment behind the mouth.

**Glabellum.** Middle projecting region of the head of Trilobites.

**Glabrous.** Surfaces of leaves or other organs devoid of hairs.

**Glacial Acetic Acid.** Anhydrous acetic acid, obtained by distilling anhydrous sodium acetate with sulphuric acid; sp. gr. 106. Crystals, mpt. 16° C.; bpt. 119° C. See ACETIC ACID.

**Glacial Era.** See GLACIAL THEORY, ICE AGE, and ECCENTRICITY, THEORY OF.

**Glacial Theory.** Doctrine that a great part of the polar and temperate regions of the globe has been once or repeatedly covered with a thick sheet of ice. The conception and publication of this view is closely associated with the name of Agassiz, but he was only one of a group of able geologists through whose labors it gradually took shape. Among these were Bischoff, Charpentier, Forbes, Desor, Escher von der Linth, Hopkins, Hugi, Martins, Sabine, Saussure, Venetz, and Guyot.

From a close study of the effects of the Swiss glaciers upon the underlying rocks was deduced the conclusion that these glaciers had once extended far beyond their present limits, and that the Valais and the Lake of Geneva had been completely filled with ice, which had even reached far up the slopes of the opposite Jura Mountains. By a not unnatural and perfectly logical expansion of this inference, it was used to explain the phenomena of the northern drift, so called. This was an accumulation of sand, clay, gravel, and erratic bowlders strewn over the n. part of Europe and America, whose origin had never been satisfactorily explained. All this material was supposed by the glacial theory to be the moraine of a vast glacier, or rather of a continental ice-sheet, which covered all the surface where such drift is found, and was carried or shoved along by the ice from higher to lower latitudes.

Daring as was the theory, it has yet steadily won its way to acceptance, being the only rational explanation of the phenomena; and geologists are now in almost complete accord on the subject. There is, however, a party which adopts a modified form of this theory and maintains that the work was done rather by ice-floes and icebergs during a submergence of the land than by glaciers. In certain cases this was probably true. Whichever of the two views is adopted, the glacial theory has proved a master-key to the geography and surface geology of the N. Temperate Zone, enabling us to explain many problems of drainage and erosion which without its aid would be inexplicable. The cause of this episode in the earth's history is not yet certainly known. See GLACIER and ECCENTRICITY, THEORY OF.

**Glacier.** Stream of ice descending along the valleys of a mountain side from the snow-field above. Its existence depends on the excess of snow-fall over evaporation, whereby a residue is left which must be removed in some other way. The constantly accumulating mass develops a pressure by which the lower layers are consolidated into ice and forced out along the line of least resistance. The ice during this process behaves, in spite of its great brittleness, exactly as a viscous body, such as pitch. The glacier thus formed creeps slowly down the slope at a rate varying from 15 inches a day during winter in the Alps to 40 or 50 feet a day in Greenland in the summer. Since the publication of the Glacial Theory of the drift, glaciers have assumed a very important place among

The Hufi Glacier, in the Maderaner Thal.

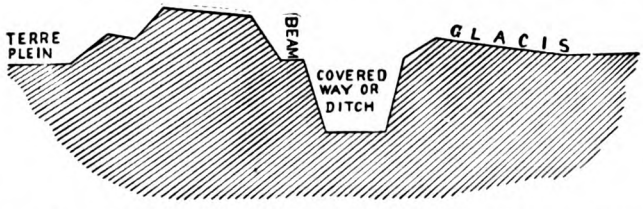
geological agents, and their phenomena have been studied with so great attention that a department of the science has come into existence called Glacial Geology. The transporting power of ice is one of its most interesting facts to the geologist. The Alpine glaciers are encumbered with masses of stone that have fallen from the overhanging ledges. These form what are called lateral moraines. They are carried down to the plain and dropped as the ice melts, thus building up a bank called the Terminal Moraine. Large quantities of similar material are also shoved along under the glacier, and more is embedded in its mass. All this contributes to the enlargement of the terminal moraine. Subglacial streams bear along much detritus, and deposit it as soon as their velocity is diminished. This latter material is rounded by rolling, and forms beds of

shingle and gravel about the terminal moraine. Huge banks of such deposit, called in different countries Kames, Eskers, and Oesar, commemorate similar action by the ancient glaciers and ice-sheets. The stones borne along near the lower surface of the ice are often smoothed and striated by friction, and the bed of rock over which they have passed shows similar

Melting Glacier over Valdal.

effects. For this reason striated stones, faceted bowlders, and planed and grooved rock-surfaces are now regarded as proofs of the former action of ice. This deduction from the observations of glacialists is the foundation of the Glacial Theory, one of the grandest generalizations of modern geology. See GLACIAL THEORY, and ECCENTRICITY, THEORY OF.

**Glacis.** That portion of the embankment in front of the covered way or ditch of a fortification where the earth is made to slope gently outward so as to bring the surface well under

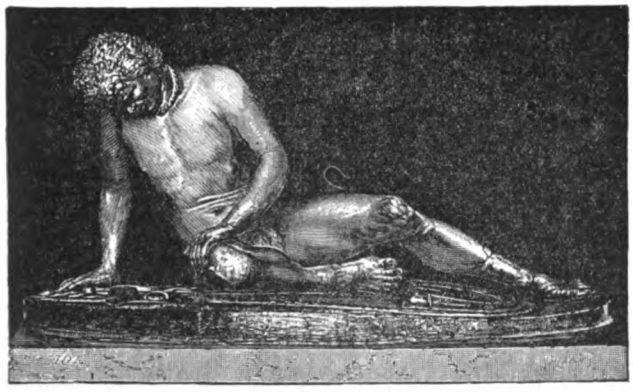



the fire from the covered way and the interior works in rear. The crest of the glacis follows the covered way entirely around the main work, and protects the scarp walls from the distant view of the enemy's batteries.

**Gladbach.** City of Prussia, near the River Niers, 16 m. w. of Dusseldorf. Pop., 1890, 49,600.

**Gladden,** WASHINGTON, D.D., LL.D., b. 1836. Cong. pastor at Springfield, Mass., 1875, and Columbus, Ohio, since 1883; ed. *Sunday Afternoon*, 1878–80. *Workingmen and Employers*, 1876; *Christian League of Conn.*, 1883; *Young Men and the Churches*, 1885; *Burning Questions*, 1889–94; *Cosmopolis City Club*, 1893.

**Gladiators.** Men trained to fight against men or beasts in the numerous sports of the arena or at funerals; first men-



Dying Gladiator (from the Capitol Museum, Rome).

tioned 264 B.C.; employed in large numbers under the Roman Emperors. They were usually captives, and were armed in different ways to secure variety. This barbarous amusement was abolished 404. Led by Spartacus, they revolted 73 B.C., defeated two armies, and were overthrown 71 by Crassus. See DYING GLADIATOR.

**Gladiolus.** Genus of showy-flowered herbs of the natural family *Irideæ*, natives of the Old World, especially plentiful in S. Africa; much cultivated for ornament.

**Gladius.** Internal skeleton or "pen" of a cuttle-fish; shaped like a quill pen.

**Gladstone,** WILLIAM EWART, b. 1809. English statesman, orator, and financier; of Scottish descent; graduated at Oxford 1831 with highest honors; M. P. 1832; Pres. of the Board of Trade 1843; Sec. of State for the Colonies 1845; Chancellor of the Exchequer 1852, 1855, and 1859–66. After Lord Palmerston's death, 1865, he became leader of the House of Commons. In Dec. 1868 he was made Prime Minister, holding office till Feb. 1874; again, April 1880 to June 1885; Feb. to Aug. 1886; and Aug. 1892 to March 1894, when he retired from office on account of advancing age. During his first administration and part of his second he was also Chancellor of the Exchequer, and in his third and fourth, Lord Privy Seal. The disestablishment of the Irish Church was carried by him, but his attempts to secure a separate parliament for Ireland (1886 and 1893), were defeated. He more than once declined the offer of a peerage. Besides numerous articles in the reviews, he has written *The State and its Relations with the Church*, 1838; *Homer and the Homeric Age*, 1858; *Juventus Mundi*, 1869; *Vatican Decrees*, 1874; *Vaticanism*, 1875; *Gleanings of Past Years*, 7 vols., 1879; *The Irish Question*, 1886.

**Glagolitic Alphabet.** Belonging to a Slavonic dialect, with some literary remains, and probably older than the Cyrillic alphabet used in Russia.

**Glaisher,** JAMES, F.R.S., b. 1809. Supt. Meteorological Dept. Royal Observatory, Greenwich, 1840–74; author of reports and memoirs on Dew, Radiation, Temperature. He made many balloon voyages for meteorological purposes, and invented the Glaisher stand for thermometers.

**Glaisher's Factors.** Series of values for a certain constant c in the formula $\tau = c\,(t - t_1)$. $\tau$ is the dew-point, determined by the August's Psychrometer: t and $t_1$ are the temperatures of the dry and wet bulbs respectively: c is a factor depending on t.

**Glaive.** Long-handled cutting weapon used by infantry in the 15th century. It differed from the bill in having a convex edge.

**Glamorganshire.** County in s. Wales containing important coal-fields and large blast-furnaces at Swansea, Cardiff, Dowlais, Bridgend and Landore. Area ab. 808 sq. m. Pop., 1891, 687,218.

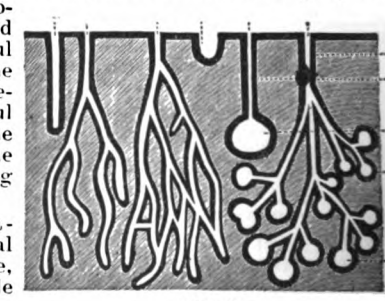
**Glance Coal.** Bright, lustrous variety of anthracite.

**Glance Cobalt.** See COBALTITE.

**Glance Copper.** See CHALCOCITE.

**Gland.** Any appendage to the epidermis of plants which secretes volatile oils or other substances.

**Gland.** An organ which modifies the blood or lymph circulating through it, separates from the blood some substance hurtful to the organism, *e.g.*, the kidney; or one which secretes some body useful in the performance of the bodily functions, *e.g.*, one of the glands secreting the gastric juice.



Glands.

**Glanders.** Contagious and always fatal disease of the horse, mule, and ass, communicable to man and due to a specific micro-organism (*Bacillus mallei*). Is characterized by fever, discharge from the nose, ulcerations within it, and enlargement of the glands which suppurate and discharge pus. Death usually results from involvement of the lungs. In chronic variety, symptoms are less violent and disease may last for months. All affected animals should be destroyed as soon as condition is recognized.

**Glaniostomi.** See CHONDROSTEI.

**Glans.** Nuts surrounded by a cupule, as the acorn of the Oak.

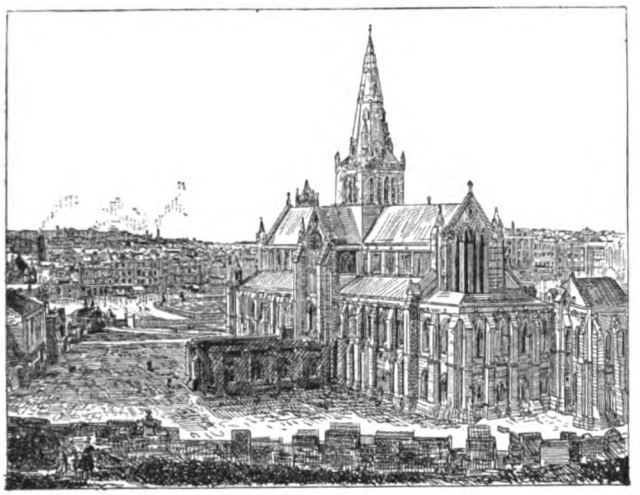
**Glanvil,** JOSEPH, F.R.S., 1636–1680. Rector of Bath 1666; prebendary of Worcester 1678. His *Vanity of Dogmatizing*,

1661, anticipated much of modern thought and planned a national Church in which opinion should be free; but his *Sadducismus Triumphatus*, 1681, defended belief in witchcraft. His *Plus Ultra*, 1668, opposed Aristotle's philosophy.

**Glanville,** RANULF DE, d. 1190. English chief justiciary 1180. *Tractatus de legibus et consuetudinibus Regni Angliæ*, pub. 1554.

**Glarus.** Swiss canton, capital Glarus, surrounded by St. Gall, the Grisons, Schwytz and Uri; area 267 sq. m. It produces slate, cattle, cotton goods and Schabzieger cheese. Pop., 1888, 33,800, principally German-speaking.

**Glasgow.** Largest city and most important commercial port of Scotland, on the Clyde. It has a very large commerce,



Glasgow—Cathedral from the Necropolis.

with shipbuilding, and iron, cotton, and glass manufactures. It is the seat of a university. Its greatness is wholly recent. The pop. has risen from 77,000 in 1801 to 785,000 in 1893, and is rapidly increasing.

**Glasgow University.** Founded by Bp. Turnbull 1451. James VI. restored and endowed it 1577. Since 1693, when it received a grant from the bishops' rents, it has made constant progress. Its funds have been increased by £376,000 in recent years. In 1895 it had a staff of 98 instructors, with 680 students in arts, 624 in medicine, 179 in law, and an aggregate attendance of 1,903, including 208 women.

**Glass.** Ordinary window glass is a silicate of calcium and sodium, made by heating together lime, sand, and soda; the purer the materials, the better the glass. Plate glass is made of the same materials, but when in a molten condition it is run into molds instead of being blown. Colors are given to glass by adding various substances: copper oxide makes a red glass; compounds of cobalt, blue; chromium and copper, green. The color of bottle glass is due to impurities.

**Glass,** ANCIENT. The art of the glass-blower is represented in paintings of the Fifth Dynasty of Egypt, but the oldest-dated entire vessel is a small, polychromatic vase of opaque glass of the time of Thothmes IV., ab. 1000 B.C. The Phenicians are no longer considered the fathers of this art, which they obtained from Egypt. Syria continued an important center of the manufacture until late in the Middle Ages. From Egypt and Syria the art was transferred to Greece and Rome In Greece glass was a rarity in the 5th century B.C. Its use grew rapidly after that time. The finest collections of ancient glass are the Slade, of the British Museum, and the Charoet, of the N.Y. Metropolitan Museum. The most famous piece of ancient glass is the Portland Vase in the British Museum. It was found ab. the middle of the 16th century 2½ m. from Rome. It is cameo-glass, white on a blue ground 10 in. high.

The Portland Vase (British Museum).

**Glass,** STRENGTH OF. The ultimate tensile strength varies from 3,000 to 9,000, and the ultimate compressive strength from 6,000 to 10,000 lbs. per sq. inch.

**Glassites.** See SANDEMANIANS.

**Glasswort.** Fleshy seaside plants of the genus *Salicornia*, natural family *Chenopodiaceæ*, of wide geographical distribution; known also as False Samphire. The ashes were formerly used as a source of soda.

**Glauber,** JOHANN RUDOLF, 1604–1668. German chemist who made many valuable additions to science. He was the first to explain a case of double decomposition, the mutual action of mercuric chloride and antimony trisulphide on each other.

**Glauber's Salt.** $Na_2SO_4+10H_2O$. Hydrous sodium sulphate, found occasionally as a mineral, and then called Mirabilite. See SODIUM SULPHATE.

**Glaucias,** 5th century B.C. Greek statuary of Æginæ.

**Glaucoma.** Disease of the eye in which it becomes of stony hardness; pressure within the eye destroys the optic nerve, and blindness often results. The pupil is usually immovable or dilated, and pain is severe. Iridectomy and the use of eserine form the best treatment.

**Glauconite.** See GREEN SAND.

**Glaucous.** Surfaces of leaves, fruits, or other organs, when covered with a blue or white bloom, which is usually a very thin layer of wax.

**Glaucus.** 1. Father of Bellerophon; torn in pieces by his own mares for contemning the power of Aphrodite. 2. Fisherman of Bœotia, who became a sea-god. 3. Ally of Troy, slain by Ajax. 4. Bronze-founder of Chios or Samos.

**Glaux.** Genus of plants of the natural family *Primulaceæ*, having no corolla and a five-valved capsule with ab. 5 seeds. *G. maritima* has small fleshy leaves which make good pickles. Also called Sea Milkwort and Black Saltwort. Grows in the mud along the seacoast.

Glaux maritima.

**Glazed Frost.** Melted surface of a snow field re-frozen into a solid ice crust.

**Glazier,** WILLARD, b. 1841. American writer, chiefly on the Civil War. Of his *Capture, Prison-pen, and Escape*, 1865, over 400,000 were sold.

**Gleason,** FREDERIC GRANT, b. 1848. Composer of several operas and the Ode for the opening of the Chicago Auditorium.

**Glebe.** Chambered structure of a puff-ball and other Fungi of the order *Gasteromycetes*.—In English Law, land belonging to a benefice or ch. living.

**Gleditsch,** JOHANN GOTTLIEB, 1714–1786. German botanist; prof. in Berlin. *Methodus Fungorum*, 1753; *Vermischte physikalisch-botanisch-ökonomische Abhandlungen*, 1765–67; *Neue Forstwissenschaft*, 1775; *Wissenschaft der rohen und einfachen Arzneimittel*, 1778–87; *Botanica Medica*, 1788–89.

**Glee.** Style of secular unaccompanied music, cultivated in England; designed to be sung by small bodies of singers, preferably three or more solo voices, generally men, or boys and men. The period of highest cultivation for the glee was from ab. 1750–1850.

**Gleet.** Clear thin discharge from the male urethra which is a common sequel of gonorrhœa and usually indicates a stricture.

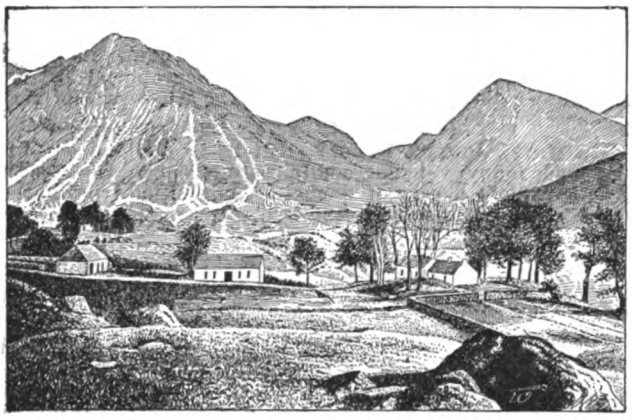
**Gleicheniaceæ.** Order of Ferns, mainly of tropical distribution.

**Gleig,** GEORGE ROBERT, 1796–1888. British officer, wounded at the taking of Washington 1814, and ordained ab. 1820; Chaplain-gen. 1846–75; Prebendary of St. Paul's 1848. He wrote histories of *British India*, 4 vols., 1831–33, and England; Lives of Warren Hastings, 1841, Clive, 1848, and Wellington, 1862; and a novel, *The Subaltern*, 1825.

**Gleim,** JOHANN WILHELM LUDWIG, 1719–1803. German poet.

**Glencoe Massacre.** In Argyleshire, Feb. 13, 1692. Thirty-eight of the Clan Macdonald were treacherously slain by soldiers of a Campbell regiment at the instigation of Sir John Dalrymple, master of Stair, under color of an order from

William III. Most of the clan escaped, but many perished from exposure.



Argyleshire (Scene of Glencoe Massacre).

**Glendower,** SIR OWEN, ab.1359–ab.1418. Welsh chieftain, great-grandson of Llewellyn; knighted 1387. On the confiscation of his estates by Henry IV. he rose in rebellion, defeated Mortimer June 22, 1402, and was proclaimed Prince of Wales.

**Glenlivet.** Valley in Banffshire, Scotland, scene of a battle between Romanists and Protestants 1594; now famous for its whisky distillery. Pop., 1891, 1,500.

**Gleyre,** CHARLES GABRIEL, 1806–1874. Swiss-French painter.

**Gliddon,** GEORGE ROBINS, 1809–1857. English archæologist, long at Alexandria; author of *Ancient Egypt*, 1850, and in part of *Types of Mankind*, 1854, and *Indigenous Races*, 1857. See NOTT, JOSIAH C.

**Glinka,** MICHAEL IVANOVITCH, 1804–1857. Russian composer, pioneer of the National School; pupil of Dehn in Berlin. His first opera, *A Life for the Czar* (*Zarskajaskisu*), produced 1836, made a hit, and its annual performance is still a patriotic duty in St. Petersburg. A second opera, *Ruslan and Ludmilla*, has also maintained a place on the stage.

**Glioma.** Malignant tumor, found in nervous tissue, and resembling sarcoma.

**Glires.** See RODENTIA.

**Glirina.** See RHIZOPHAGA.

**Glisson,** FRANCIS, M.D., 1597–1677. Prof. Cambridge 1636, London 1639; author of medical works; discoverer of a capsule in the liver.

**Gloag,** PATON JAMES, D.D., b. 1823. Scottish commentator.

**Gloaming.** Darker portion of morning or evening twilight.

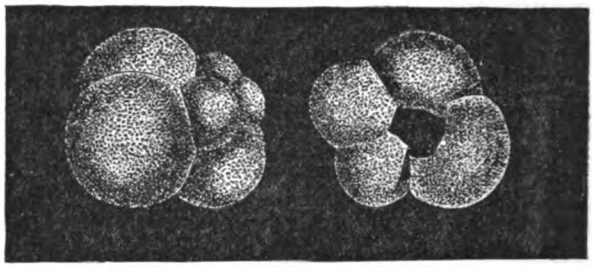
**Globe.** The oldest model of the earth is at Nelletri and dates from 1225. The earliest globe of importance bears the date of 1492 and was made by Martin Behaim of Nuremberg, Germany, where it is still preserved. It is 21 in. in diameter, of pasteboard covered with parchment. The Lenox Library, N. Y., possesses a copper globe, 4½ in. diameter, whose date is ab. 1506–7, which is probably the earliest post-Columbian globe known. Globes are made of paper, superimposed, sheet upon sheet, upon a wooden or metal globe, until the required thickness is attained. This is then cut in half, removed from the form, and joined with glue. The map is then laid on in sections. At the Paris Exposition of 1889 a steel globe of one-millionth the earth's circumference, ab. 131 ft., was exhibited, and at the World's Columbian Exposition the U. S. Government exhibited a globe 63 ft. in circumference.

**Globe Fish.** See PLECTOGNATHI.

**Globe Flower.** Herbs of the genus *Trollius*, natural order *Ranunculaceæ;* marsh plants of the n. hemisphere.

**Globe of Compression.** Military mine when overcharged; *i.e.*, when the crater radius exceeds the line of least resistance.

**Globigerina.** Foraminifer ab. as large as a pin-head; abundant in the ocean and in marine deposits. It has a perforated, hyaline shell, composed of spherical chambers arranged spirally, the smallest in the center. Numerous slender pseudopodia radiate out through the pores, and there are besides numerous long hollow spines. The ooze at the bottom of the deep sea consists largely of the shells of these animals, that have dropped from the surface.



Shells of Globigerina, greatly enlarged.

**Globigerinidea.** Order of perforate *Foraminifera.*

**Globoid.** Speck of mineral matter occurring in grains of aleurone in vegetable cells.

**Globus Hystericus.** Choking sensation, as if due to the presence of an obstruction in the throat, often observed in hysteria, and probably due to a spasmodic contraction of the muscles of the throat.

**Glochidiate.** Organs or processes barbed like a fish hook.

**Glochidium.** Larva of the fresh water clam. It has a bivalved shell with a tooth on the edge of each for holding on to the gills of fishes.

**Glochids.** Hair-like appendages, barbed at the tip, borne on the massulæ of certain *Rhizocarpeæ.*

**Glogau.** Fortified town in Silesia, on the Oder; stormed by the Prussians 1741; occupied by the French 1806–14. Pop., 1890, 20,529.

**Glomerule.** Compact, cymose flower cluster, as in Dogwood.

**Glomeruli.** Bunches of looped capillaries found in the outer or cortical part of the kidneys. They are the terminal dilatation of the kidney artery arranged in this manner to permit of the separation of the urinary constituents from the blood.

**Glommen,** or STOR-ELV. Chief river of Norway. Length ab. 400 m.; drainage area 15,926 sq. m.; descent, from Lake Aursund to the Shagerrack, 2,339 ft.

**Gloria in Excelsis.** Greater doxology of the Church, which in the Mass follows the Kyria. In the Communion Service of the English Ch. it comes at the end, just before the blessing. It is founded on the song of the angels, Luke xi. 14, and is called the Angelical Hymn.

**Gloria Patri.** Lesser doxology, expressing belief in the Trinity. In the English Ch. it is said or sung after each psalm.

**Glossa.** Tongue, or ligula, of insects; median terminal part of the second maxilla.

**Glosses.** Marginal notes or interlineations on a MS., sometimes made part of later texts; explanations and comments, in biblical and legal literature.

**Glossitis.** Inflammation of the tongue. The acute form comes from effect of mercury or some irritant, or injury to the tongue. Origin of the chronic form is very obscure. For the acute form astringent washes and ice-water are used; chronic form requires operation.

**Glossophora.** See CEPHALOPHORA.

**Glottis.** Opening between the vocal cords.

**Gloucester.** Ancient city of England, on the Severn; held

Gloucester.

by Parliament 1643, and besieged by the royal forces. Pop., 1891, 39,444.

**Gloucester.** City of Essex co., Mass., on the seacoast. It has an excellent harbor. The principal industry is fishing. Pop., 1890, 24,651.

**Glouvet,** JULES DE. See BEAUREPAIRE, G. DE.

**Glover,** RICHARD, 1712–1785. English poet. *Leonidas*, 1737; *The Atheniad*, 1787.

**Gloversville.** City of Fulton co., N.Y., on a branch of the Mohawk. It has large manufactures of gloves and shoe-leather. Pop., 1890, 13,864.

**Gloves.** Known to the ancients, but only important after the northern conquests. They were a sign of rank in the Middle Ages, and might not be worn in church or in presence of a superior. The custom of constantly carrying a pet falcon on the finger extended their use. They were long and wide on the wrist, and sometimes slit down the fingers to display the rings. As part of the regal or hierarchical habit they were jeweled on the back. Gloves of leather, silk, and worsted were worn in the 16th and 17th centuries. They were worn in the cap as favors and cast down as a challenge. They were costly presents, especially perfumed Italian and Spanish. In the 18th century chicken-skin gloves were worn at night to soften and whiten the skin.

**Glow Worm.** Species of the genus *Lampyris*. Strictly applicable only to the female, which resembles a caterpillar, is wingless, and emits a faint green light from the abdomen. The male is non-phosphorescent and has wings, resembling a beetle. Found in grass and mossy banks. Related species are known as Fire Flies and Lightning Bugs.

**Glucinum.** See BERYLLIUM.

**Gluck,** CHRISTOPH WILLIBALD, RITTER VON, 1714–1787. German composer, reformer of the opera. Until he began composing for Paris, he wrote Italian operas mostly of the conventional type, winning great popularity in Italy, London, whither he went 1745 as composer for the Haymarket Theater, and Vienna. He found a collaborator of like mind in Calzabigi, who provided him with the libretto of *Orfeo ed Euridice*, 1762, *Alceste*, 1767, and *Paride ed Elena*, 1769. In the prefaces to the last two he laid down the principles on which he purposed a reform of operatic composition. These were to curb the vanity of singers by restricting them to the music written, to make music itself secondary to an expression of the sentiment of the dramatic text, to abolish the *Da Capo*, to make the overture harmonious in character with the drama, and to cultivate directness and simplicity in place of vocal display. His pupil, Marie Antoinette, was instrumental in bringing G. to Paris, where a historic controversy between his friends and those of Piccinni grew out of the performance of his *Iphigenie en Aulide*, 1772.

**Glucoses.** Sugars of the symbol $C_6H_{12}O_6$. They are either aldehyde-alcohols or ketone-alcohols. Most of these ferment directly. See DEXTROSE and LAEVULOSE. Commercial glucose made by the action of sulphuric acid upon starch is mainly dextrose and contains also dextrine.

**Glucosides.** Vegetable substances broken up by acids, alkalies, or ferments, yielding as one of the products a glucose, often grape sugar. They are white solids, and are usually easily decomposed. Examples are amygdalin, salicin, and coniferin.

**Glue.** Compound containing carbon, hydrogen, oxygen, and nitrogen; obtained by boiling bones and cartilage with water; soluble in water; perhaps a condensed amido-acroleine ($CHNH_2$:CH.CHO.). Its adhesion, or tensile strength, in holding wooden pieces together is ab. 500 lbs. per sq. inch of surface. See GELATINE.

**Glume.** Small bracts which subtend the flowers of grasses and sedges.

**Gluten.** Albuminoid, present in grains; consisting of carbon, hydrogen, sulphur, nitrogen, and oxygen; prepared from commercial gluten; amorphous substance, insoluble in water and not very soluble in mineral acids, but soluble in organic acids. Commercial gluten contains other albuminoids, as fibrin. It may be prepared by washing flour, to remove the starch, and is used as a substitute for making bread, etc., for the use of diabetics.

**Gluten Meal.** By-product in the manufacture of glucose from corn meal, making a fodder rich in protein matters and a palatable food for most animals. It seems to have a stimulating effect on milk secretion, and is largely fed to milch cows. It is also known as sugar meal, buffalo meal, etc.

**Glut of Rain.** Very heavy rainfall.

**Glutton.** The Java Cat or Musang is called the Masked Glutton. *Gulo borealis* exists in the boreal regions of the Old and New Worlds. It is ab. 3 ft. long to the root of

Glutton (*Gulo borealis*).

the tail and is very powerful, voracious, and ferocious. See WOLVERINE.

**Glycas,** MICHAEL. Byzantine author, imprisoned 1156. His history of the world to 1118 was pub. in Latin 1572, and in the original 1618–60.

**Glyceric Acid.** $CH_2OH.CHOH.COOH$. Dihydroxyproprionic acid; thick syrup, produced by the action of nitric acid and water upon glycerine.

**Glycerides.** Glyceryl compounds of monatomic acids. Mono-, di-, and triglycerides are known, containing one, two, and three acid residues. Examples:

(Monoglyceride=$CH_2OH.CHOH.CH_2C_2H_3O_2$=monacetin:
Diglyceride=$CH_2OH.CHC_{16}H_{31}O_2.CH_2C_{16}H_{31}O_2$=dipalmitrin:
Triglyceride=$CH_2C_{18}H_{35}O_2.CHC_{18}H_{35}O_2.CH_2C_{18}H_{35}O_2$.=tristearin.)

The fats are mixtures of triglycerides. All glycerides yield glycerin and fat acid salts (usually soaps), when decomposed by heating with a caustic alkali.

**Glycerin,** or GLYCEROL. $CH_2OH.CHOH.CH_2OH$. Bpt. 290° C. Trialcohol, containing three atoms of carbon; prepared by the decomposition of the fats by alkalies, acids, or water; colorless syrup, with a sweet taste; used in the manufacture of preserves, shoe-blacking, nitroglycerine, and for a variety of other purposes. See GLYCERIDES, FATS, and SOAPS.

**Glycerin Nitrates.** See NITROGLYCERIN.

**Glyceryl.** Group or radical $CH_2.CH.CH_2$, combined in glycerin with three OH groups. See FATS.

**Glycocoll.** $CH_2NH_2.COOH$. Mpt. 170° C. Amidoacetic acid; colorless, crystalline substance, with a sweet taste, prepared by the action of dilute acids upon hippuric acid. See HIPPURIC ACID.

**Glycogen.** Substance found around the spores within the asci in the Fungi of the sub-class *Ascomycetes*, where it is separated from the protoplasm at or before the time of spore formation.—Variety of starch found in the body, especially in the liver.

**Glycol.** $CH_2OH.CH_2OH$. Ethylene glycol. Sweet liquid, prepared from ethylene bromide by the action of silver oxide or potassium hydroxide. It presents the characteristics of an alcohol. Oxidizing agents change it into glycolic and oxalic acids. The term Glycols is applied to all alcohols derived from marsh gas hydrocarbons containing two hydroxyl groups.

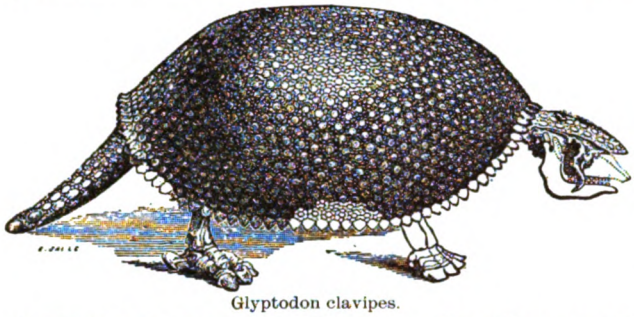
**Glycolic Acid.** $CH_2OH.COOH$. Mpt. 80° C. Oxyacetic acid. Monobasic colorless acid, crystallizing in prisms, present in unripe grapes and fruits; prepared by the oxidation of alcohol with nitric acid; easily oxidized to oxalic acid.

**Glyoxal.** CHO.CHO. Dialdehyde, formed by the gentle oxidation of alcohol or acetaldehyde.

**Glyoxalic Acid.** CHO.COOH. Aldehyde acid, occurring in unripe fruits, especially grapes and gooseberries; monobasic acid, crystallizing in prisms; soluble in water.

**Glyph.** Flutings or perpendicular channels ornamenting parts of the Doric frieze.

**Glyptodon.** Extinct gigantic Armadillo, found in the Pleistocene of S. America; much resembling its modern puny representative. It had a carapace shaped like that of the turtle



Glyptodon clavipes.

and consisting of many polygonal scutes. The tail was incased by rings. Teeth 32, each with two longitudinal grooves on the outer and on the inner sides. The legs were stout, and the front feet had usually only four toes. A length of 9 ft. was attained.

**Glyptothek.** Sculpture gallery of Munich. Its finest pieces are a torso from a Niobe group called the Ilioneus, and the gable statuary of a Greek temple on the island of Ægina.

**Gmelin,** JOHANN FRIEDRICH, 1748–1804. Prof. in Tübingen 1771, and Göttingen 1778. *Onomatologia botanica completa*, 1772–78; *Allgemeine Geschichte der Pflanzengifte*, 1803.—His son, LEOPOLD, 1788–1853, prof. Heidelberg 1817–50, wrote on digestion, 1820–27. *Handbuch der Chemie*, 1817–19.

**Gmelin,** JOHANN GEORG, 1709–1755. Uncle of J. F.; prof. at St. Petersburg 1731, and Tübingen 1749; traveler in Siberia 1733–43. *Flora Sibirica*, 1748–49; *Reisen durch Siberien*, 4 vols., 1751–52.—His brother, PHILIPP FRIEDRICH, 1721–1768, was also prof. at Tübingen, and wrote on botany and medicine.—Their nephew, SAMUEL GOTTLEIB, 1744–1774, became prof. at St. Petersburg 1767, and traveled in s. Russia. *Historia Fucorum*, 1768; *Reisen*.—His cousin, WILHELM FRIEDRICH, 1745–1821, was an eminent engraver.

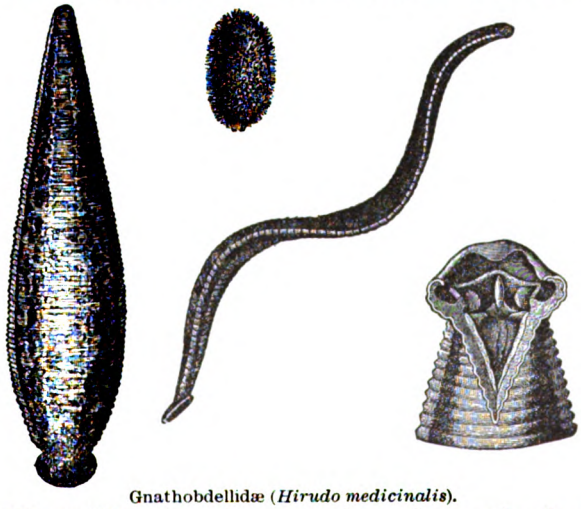
**Gmelinite.** $(Ca,Na_2)Al_2Si_4O_{12}+6H_2O$. Hydrous sodium aluminium silicate, belonging to the zeolitic family of minerals; found in Nova Scotia and at Bergen Hill, N. J.

**Gmunden.** Town in Upper Austria, on the Traun river and lake, much visited for its beautiful scenery. It is also the chief center of the salt-mines and trade. Pop. ab. 4,000.

**Gnat.** See NEMOCERA.

**Gnathites.** Masticatory organs of *Crustacea*.

**Gnathobdellidæ.** Leeches with three jaws and a sucker at each end. *Hirudo* has 95 rings, though only 18 true segments, five pairs of eyes on the anterior segments. The male genital orifice is between the 24th and 25th, the female between



Gnathobdellidæ (*Hirudo medicinalis*).

the 29th and 30th rings. The stomach has eleven pairs of cæca. *H. medicinalis* or *officinalis* has nearly 30 teeth on each jaw, is nearly three inches long, and is cultivated in Europe for blood-letting.

**Gnathopoda.** See ENTOMOSTRACA.

**Gnathostegite.** Ischiopodite and meropodite of the third maxilliped of Crabs.

**Gnathostomata.** Copepods that are generally non-parasitic. *Cyclops* is an example.

**Gnathotheca.** Sheath of the lower mandible in birds.

**Gneisenau,** AUGUST WILHELM ANTON, GRAF NEIDHART VON, 1760–1831. German soldier in the wars against Napoleon; as Blücher's chief of staff, distinguished in the campaign of 1815.

**Gneiss.** Foliated rock having the same mineralogical composition as granite: feldspar, quartz, and mica. It is one of the most abundant rocks in the older geological formations.

**Gneist,** RUDOLPH VON, LL.D., 1816–1895. Prof. of Jurisprudence Univ. Berlin 1844; Deputy 1867; ennobled 1888. *English Constitutional History*, 1882, tr. 1886; *English Parliament*, tr. 1886.

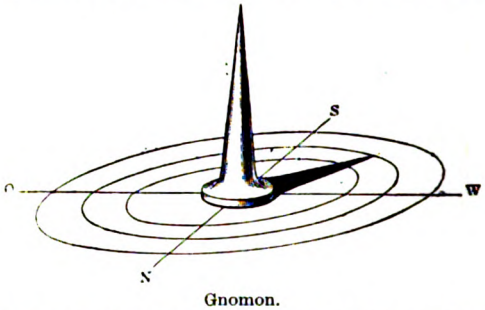
**Gnetaceæ.** Natural family of flowering plants of the class *Gymnospermæ*, comprising three genera and ab. 36 species, found in Europe, the Mediterranean region, Asia, tropics of America, and s.w. Africa; commonly called the Joint Firs.

**Gnoli,** DOMENICO, b. 1839. Italian poet, essayist, and translator; prof. Turin; librarian at Rome. *Odi Tiberéne*, 1879–85; *Studi Letterari*, 1883.

**Gnome.** In Mediæval Mythology, underground spirit, especially in mines; *e.g.*, the German Rübozahl.

**Gnome.** Brief and pithy saying, usually didactic and in verse; common in many literatures. The fragments of Theognis and other Greek Gnomic poets have been edited by Brunck, 1784, and others.

**Gnomon.** Primitive instrument, much employed by ancient astronomers. It consisted of a vertical staff, or in some cases a stone pillar. By measuring the length of the shadow at




Gnomon.

different seasons, data were obtained for solving a number of astronomical problems.—Space between two similar parallelograms having one angle coincident.

**Gnosticism.** Early endeavor, made in infinite variety of form, to use Christianity as the means of propagating a theosophic Pantheism, expressed in the guise of emanationist mythologies. The Gnostics were usually dualists, and ascribed creation to a Demiurge, subordinate or opposed to the original Deity. Their importance was intellectual rather than practical, and chiefly ab. 50–220. The leading names were Cerinthus, Basilides, Marcion, Valentinus, and Bardesanes.

**Gnu.** Sometimes called Horned Horse; really an Antelope, indigenous to S. Africa, where it associates with the Quagga. The horns are broad at the base, bend downward to the eyes, and then upward and forward. There is a stiff mane of short bristles; the tail resembles that of the horse. The head is ox-like and has bristles about the nose. Size, 4 ft. high by 9 ft. long. The Brindled Gnu is larger, has stripes on the shoulder, and the horns turn outward instead of forward. It is found in Zululand.

**Goa.** Capital of the Portuguese settlement in s.w. India under Albuquerque 1510; once large and prosperous; abandoned to the clergy 1759, and mainly ruined. Pop. ab. 1,850. Nova Goa, or Panjim, 6 m. n., took its place; pop. ab. 15,000. The area of the Portuguese possessions is 1,262 sq. m.; pop. ab. 450,000.

**Goaf,** or GOB. Worked-out portion of a coal mine, used as a place of deposit for waste rock, or choked up by falls of roof. Goaves are ventilated with difficulty; gas frequently accumulates in them, and fires occur spontaneously.

**Goats.** Various species of wild goats grade into the Ibexes, with which they readily interbreed. *Capra ægagrus*, the Bezoar Goat of western Asia, and *C. falconeri*, the Cashmere Goat of Thibet, are supposed to be the stock whence our domestic goats have been derived. *C. hircus* furnishes the celebrated Angora wool or silken hair. The leather made from goats' hides in Morocco is especially valuable. Goats' milk is rich in caseous constituents. See OVIDÆ.

**Goat's Beard.** *Spiræa aruncus*. Large perennial herb of the Rose family, native of the e. U. S., Europe, and Asia.

**Goat's Beard,** False. *Astilbe decaudra.* Large herb of the Saxifrage family, native of the s. Alleganies.

**Goat's Rue.** See Catgut.

**Goatsuckers.** These birds are night-flyers, some species from their cry being called Whip-poor-Wills; others are Night Hawks. They have long wings, a short broad gape, and rictal bristles. They feed on flies, mosquitoes, etc. From the habit

Goatsucker (*Caprimulgus vociferus*).

of catching flies under the bellies of cattle, sheep, etc., they have been erroneously supposed to suck milk from the teats. Their mournful night cries have been considered as boding ill by the superstitious of all races. See Fissirostres and Cypseli.

**Gob.** See Goaf.

**Go Bang.** Game played with men or pieces upon a board like that used for draughts or chess, in which the players endeavor to get five men in a row. Introduced from Japan into the U. S., its name is a corruption of the Japanese *go ban*, or board for the game of *go*, upon which it may be played.

**Gobelins.** French government factory of tapestries at Paris, since 1662; established ab. 1500 by Belgian dyers. The style employed imitates that of oil paintings, which is not to be commended in tapestry.

**Gobi,** or Shamo. Desert of the interior of Asia, comprising most of e. Turkestan and Mongolia, stretching e. and w. ab. 1,500 m. and n. and s. from 500 to 700 m. Most of it was once occupied by an inland sea, as is shown by its terraces. The w. part is sandy and almost without vegetation. The e. part has a gravelly soil, sparsely clothed with heath, and with an occasional tree.

**Gobiidæ.** Family of acanthopterygian Fishes, including 400 species. Most are small. The most remarkable is *Periophthalmus*, which has a frog-like head; its eyes can stand out and turn in different directions; the pectorals are long and can be used for progression on land. The fish in fact hops after flies and other prey on the beach. These species are African.

**Goblet,** René, b. 1828. French Deputy 1871; Minister of the Interior 1882, and twice of Public Instruction; Premier Dec. 1886–May 1887; Senator 1891.

**Goblin.** Malevolent domestic spirit of Northern folklore.

**God.** Familiar name of the Supreme Being, called in O. T. El, Elohim, and Jehovah; by the Jews Adonai; worshiped by most Christians as Trinity in Unity, Father, Son, and Holy Ghost.—Name for the First Cause of all things, but implies besides this function that of intelligence, justice, and benevolence. Arguments for the existence of God usually stop with proving the necessity of a first cause, and do not realize that distinct methods are required to prove the existence of intelligence and morality with the function of being the Absolute. The term, however, stands for both casuality and personality in the Absolute, and usually represents all that a given age idealizes for itself.

**Godard,** Benjamin Louis Paul, 1849–1894. French musician, composer in all forms except ch. music. He took a prize 1878 with *Tasso*, a dramatic symphony with soli and chorus. Two operas, *Pedro de Zelaméa*, 1884, and *Jocelyn*, 1888, have been performed.

**Godard,** Jules, 1802–1873. French aeronaut, frequent colaborer in balloon voyages for scientific purposes.

**Godavari.** River of India, flowing e. into the Bay of Bengal. Length 898 m., drainage area 112,200 sq. m.

**Godéfroy,** Frédéric, b. 1826. French author. *Histoire de la Litterature Francaise*, 8 vols., 1859–78; *Lexique de la Langue de Corneille*, 1862; *Dictionnaire de l'ancienne Langue Francaise*, begun 1880.

**Godet,** Frédéric Louis, D.D., b. 1812. Swiss N. T. commentator; pastor and prof. at Neuchâtel from 1851. Most of his books have been translated. *Études bibliques*, 1873–74, tr. 1875–76.

**Godfrey** of Bouillon, 1061–1100. Duke of Brabant 1089; leader of the First Crusade 1095. He besieged Jerusalem, and took it July 15, 1099; refused the crown, but governed the city, and died there.

**Godiva.** Patroness of Coventry, which she relieved from certain exactions of her husband, Leofric, Earl of Mercia, by riding naked through the streets ab. 1040; commemorated in processions till 1826. The legend is traced to ab. 1200.

**Godkin,** Edwin Lawrence, b. 1831 in Ireland. Ed. N. Y. *Nation* from 1865, and *Evening Post* since 1881. *History of Hungary*, 1856; *Government*, 1871; *Reflections and Comments*, 1895.

**Gödöllö.** Town of Hungary, 15 m. n. e. of Pesth; scene of defeat of Austrians by Hungarians under Görgey April 6, 1848. Pop. ab. 4,000.

**Godolphin,** Sidney, Earl of, 1645–1712. Sec. of State 1684; Commissioner of the Treasury 1687–90; First Lord of same 1690–97; Lord High Treasurer 1702–10; Earl 1706. He retained power under four sovereigns because of his mastery of finance.

**Godoy,** Manuel de, Duke of Alcudia, 1767–1851. Favorite of Charles IV. of Spain; Sec. of State 1792; Captain-gen. 1793, He lived on most intimate terms with the queen, negotiated the treaty of Bâle 1796, and won the title of Prince of the Peace; became Grand-Admiral 1799, and Generalissimo 1804; aided Napoleon to gain possession of Spain; was imprisoned, but released by Napoleon 1808; lived in Paris from 1835.

**Gods,** The Twelve Great. Chief divinities of the Greeks and of the Romans, who adopted them under other names. These were: Zeus, the supreme god, Jupiter; Here, the Queen of Heaven, Juno; Poseidon, god of the waters, Neptune; Phoibos, the sun, giving light, and the wind, giving inspiration; Apollo; Athene, goddess of wisdom and knowledge, Minerva,

The Feast of the Gods, by Hoet

Aphrodite, goddess of beauty, Venus; Ares, god of war, Mars; Hephaistos, teacher of the useful arts, Vulcan; Hestia, presider over the domestic hearth, Vesta; Demeter, who ripened the harvest, Ceres; Artemis, sister of Phoibos, lover of the swift arrows, Diana; and Hermes, the messenger, teacher of eloquence, craft, and theft, Mercury.

**God Save the King.** English national anthem. Its authorship was long in dispute, because of the resemblance between its melody and those of other songs, but is now generally assigned to Henry Carey. It came into notice 1740. The melody has been utilized for patriotic songs in Germany (*Heil dir im Siegerkranz*), and the U. S. (*My Country, 'tis of Thee*).

**God's Truce.** Period during which feudal lords kept the peace, abstaining from private war, rapine, and robbery, and women, pilgrims, priests, travelers, merchants, and tillers of the soil were unmolested. It lasted from Wednesday evening to Monday morning every week, all Lent and Advent and other holy days. This custom was in force from 1027 to ab. 1270.

**Godwin,** d. 1053. Earl of the West Saxons; supporter of Canute, after whose death, 1035, he abandoned the Danish

cause, and helped to place Edward the Confessor on the throne 1042; exiled 1051, recalled 1052; father of Harold.

**Godwin,** FRANCIS, 1561–1633. Bp. of Llandaff 1601, and Hereford 1617. His strange romances, *Nuncius Inanimatus*, 1629, and *The Man in the Moon*, 1638, served as precedents if not models for many similar works.

**Godwin,** PARKE, b. 1816. American journalist and author. *Doctrines of Fourier*, 1844; *Vala*, 1851.

**Godwin,** THOMAS, D.D., 1587–1642. English antiquarian.

**Godwin,** WILLIAM, 1756–1836. English author. Besides *Caleb Williams*, 1794, *St. Leon*, 1801, and other novels, he wrote Lives of Chaucer, 1801, and Chatham, 1812, a *History of the Commonwealth*, 4 vols., 1824–28, and *Lives of the Necromancers*, 1834. *Autobiography*, 1874.—His wife, MARY WOLLSTONECRAFT, 1759–1797, pub. *Vindication of the Rights of Woman*, 1792, and a *View of the French Revolution*. Both held radical views.

**Goeben,** AUGUST VON, 1816–1880. German general, prominent in 1866 and 1870–71.

**Goeppert,** HEINRICH ROBERT, b. 1800. Prof. of Botany at Breslau. *Systema Filicum fossilium*, 1836; *Die Gattungen der Flora Fossilen Pflanzen*, 1841–45; *Monographie der fossilin Coniferen*, 1850; *Die fossile Flora der Permischen Formation*, 1864–65.

**Goes,** JAN ANTONISZ, 1647–1684. Dutch poet and dramatist.

**Goessman,** CHARLES ANTHONY, b. 1827 in Germany. Prof. Mass. Agricultural Coll. 1869; Director Mass. Agricultural Experiment Station since 1882. He has given particular attention to commercial fertilizers and stock feeding.

**Goethe,** JOHANN WOLFGANG VON, 1749–1832. German lyric and dramatic poet, novelist, and scientific writer. His first great works were *Götz von Berlichingen*, a drama of national history, 1773, and *Werther*, 1774. From 1775 he lived at Weimar, the head not only of the literary group there, but of German literature. There he produced his greatest works: *Iphigenia*, 1779; *Egmont*, 1788; *Wilhelm Meister*, 1795; *Hermann und Dorothea*, 1797; *Faust*, 1st part, 1805; *Elective Affinities*, 1809; *Westöstlicher Divan*, 1813; *Faust*, 2d part, 1830. His lyric poetry has a wonderful compass, his ballads especially. He held several offices, and was greatly valued by the Grand Duke. In botany he wrote *Versuch die Metamorphose der Pflanzen zu erklären*, 1790, and *Zur naturwissenschaft überhaupt, besonders zur Morphologie*, 1817–24. After pub. the *Metamorphoses of Plants*, 1790, he projected, and in 1813 pub., the *Metamorphoses of Animals*, in which he traces unity of type in the structure of all animals. He was thus an evolutionist and opposed to Cuvier. His conception of the skull as consisting of modified and ankylosed vertebræ, best developed by Owen in his *Anatomy and Physiology of Vertebrates*, has been replaced by a more modern theory involving the affirmation of the principle that the head is segmented, but denying the vertebral character of its bones. See CEPHALIC SEGMENTS.

Johann Wolfgang von Goethe.

**Goethite.** $H_2Fe_2O_4$. Hydrous ferric oxide with ab. 10 per cent of water, standing in this respect intermediate between turgite and limonite. A variety with a velvety surface is called przibramite.

**Goettling,** KARL WILHELM, 1793–1869. Prof. Jena 1832; writer on the *Nibelungenliede*, 1814–17; *Greek Accentuation*, tr. 1831; *Hist. Roman Constitution*, 1840.

**Goetz,** HERMANN, 1840–1876. German musician, whose opera, *The Taming of the Shrew*, produced 1874, won much fame. He left a second opera, *Francesca da Rimini*.

**Goffe,** WILLIAM, ab. 1605–1679. English regicide, who escaped to America 1660; legendary hero of a mysterious appearance at Hadley, Mass., 1675, when he repelled an Indian attack.

**Gog and Magog.** Colossal figures in Guildhall, London, said to represent a Saxon and an ancient Briton: cockney tutelary deities.

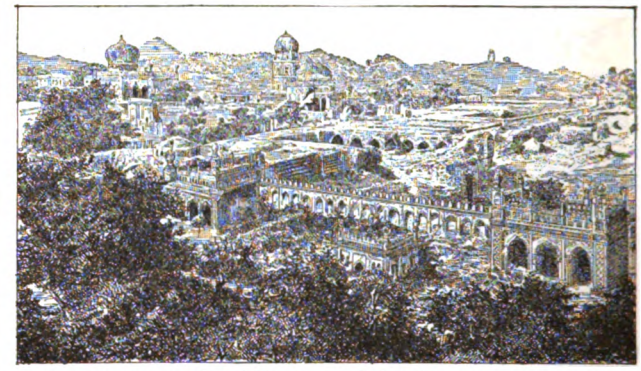
**Gogol,** NIKOLAI VASILIEVITCH, 1809–1852. Russian novelist. *Evenings at a Farm*, 1831–32; *Mirgorod* (including *Taras Bulba*), 1835; *Arabesques*, 1835; *The Inspector*, a play, 1836; *Dead Souls*, 1842. These books, with their powerful realism, had great influence on later Russian literature.

**Gohunyin.** Burmese national game played with the seeds of a huge creeper, the *Eutada pursoetha*. These are made to stand in a long row, and the players throw at them with the same kind of seeds or iron rings. The object is to knock down the greatest number, a favorite game being one in which the players endeavor to knock down five with five shots in succession.

**Goito.** Village of Italy, on the Mincio, near Mantua; scene of Piedmontese victories over the Russians, April and May, 1848.

**Goître.** Enlargement of the thyroid gland. See CRETINISM and EXOPHTHALMIC GOÎTRE.

**Golconda.** Town and fortress 5 m. w. of Hyderabad, India. It was the capital of a Mohammedan dynasty founded


Royal Necropolis, Golconda.

by Kuli Kutub Shah. It has magnificent royal mausoleums, and was long famous for diamonds which were merely cut here.

**Gold.** Au. At. wt. 197, sp. gr. 19.35, sp. ht. .0324, valence I. III., mpt. 1045° C. Yellow metal, known to the ancients. It is not acted upon by oxygen even at a high temperature, and not attacked by any one acid, aqua regia being the only one which will dissolve it. Chlorine, bromine, cyanides and thiosulphates dissolve it. Reducing agents and many metals precipitate gold from its solution as a dark-brown powder. It forms two classes of compounds: the aurous, in which it is univalent, and the auric, in which it is trivalent; in some compounds it is apparently bivalent.

**Gold,** CLOTH OF. Rich Oriental fabric made of silken crossed by golden threads, much used for Mediæval state dresses.

**Gold,** METALLURGY OF. Found in nature mostly as free particles in alluvial deposits (placer gold), from which source probably nine-tenths has come, or disseminated through quartz

Chinese washing auriferous sands with cradle, at the Australian placers.

or iron pyrites in veins. The largest deposits are in Cal. and Australia. In Europe it is most abundant in Hungary. There and in Colorado and Calaveras co., Cal., compounds of gold and tellurium are found, the most abundant of which is Sylvanite,

a telluride of gold and silver. Native gold usually contains silver and frequently platinum, palladium, iron, copper, lead, or mercury. Many silver ores contain gold, which passes into the mercury or lead in which the silver is concentrated, and thence into the fine silver, from which it is separated by dissolving the silver out in nitric or sulphuric acids, or by passing chlorine gas into the melted alloy, whereby the silver forms chloride, which volatilizes, while the gold is untouched.

Pure gold has tensile strength in castings 7 tons per sq. inch with 30 per cent elongation, expansion by heat $\frac{1}{62}$ from 0° to 100° C. It is one of the most ductile and malleable of metals; leaf has been made $\frac{1}{367,500}$ of an inch thick. Conductivity for heat 98, for electricity 58 (silver=100). For coinage and jewelry, it is alloyed with 10 per cent of copper (red gold) or silver (yellow gold); 22 per cent of aluminium makes a rich purple alloy, which is not workable. U. S. coin have 90 gold and 10 copper.

The mining and working of gold ores depend on their nature. Free gold in alluvial deposits is separated from gravel, sand, etc., by its greater specific gravity, by washing in the hand-pan, cradle, long tom, or sluices. Powerful streams of water are used to wash gravel banks into sluices, in which the gold is caught by strips nailed across the bottom. This is hydraulic mining. When the gold is free in a vein, the rock is crushed fine in the presence of mercury, which amalgamates with the particles of gold. The mercury is squeezed through canvas bags, leaving a rich pasty amalgam with 30 per cent of gold inside: this is heated and the mercury distilled off, condensed, and used over, while the spongy gold is melted down in a crucible with borax and niter. The crushing and amalgamating are usually done in stamp mills, or in mills similar in action to the Mexican arastra. When the gold occurs in sulphide ores, it is so finely divided that amalgamation is imperfect. In this case, chlorination is frequently used (Plattner's process). The sulphides are roasted until converted into oxides; they are then moistened, packed in boxes with a false bottom, and chlorine gas passed upward through the mass. Any gold is converted into soluble gold chloride, which is washed out with water and the gold precipitated by copperas, charcoal, or hydrogen sulphide gas. The MacArthur-Forrest cyanide process is used on an enormous scale for treating very poor gravels in the Transvaal. The gravel is put into a tank with a false bottom, and a dilute solution of sodium cyanide allowed to filter slowly through. The gold dissolves, and is precipitated from the solution by metallic zinc or aluminium, or by electrical deposition. The cost of treatment in this way is less than $1 per ton of gravel, so that very poor material can be treated.

Original Hydraulic Mining.

Since 1848 the world's yield of gold has been extraordinarily great. From 1493 to 1848 the total production has been estimated at ab. $3,300,000,000; while between 1848 and 1894 the yield was nearly $5,300,000,000. In 1853 Cal. produced ab. $60,000,000; all the mines of the world $160,000,000. The world's production in 1893 amounted to $157,228,000 of which the U. S. produced $35,955,000, Australasia $35,688,600, Africa $29,305,800, Russia $26,454,400. The amount used in the arts and manufactures in the U. S. 1893 was $12,523,523. Total obtained in U. S. 1847–90 $1,847,170,000. The commercial ratio of gold to silver in 189 B.C. was, in Rome and the Greek states, 10 to 1; 30 B.C. 7½ to 1; 70–225, 12½ to 1; in England, 1546, 10 to 1; 1663, 14 to 1; 1849, 15.63 to 1; 1893, 26.49 to 1; 1894, 32.56 to 1. In ancient Egypt and Persia it was 13⅓ to 1. It was known to the ancients; was discovered (by the Spaniards) in Africa 1492; in Malacca 1731; in Ceylon 1800; in California Sept. 1847; in Australia 1851; in South Africa Oct. 1868; in West Australia Sept. 1870.

**Gold-Beaters' Skin.** Delicate membrane prepared from the cæcum of the ox for use in surgery and gold-beating.

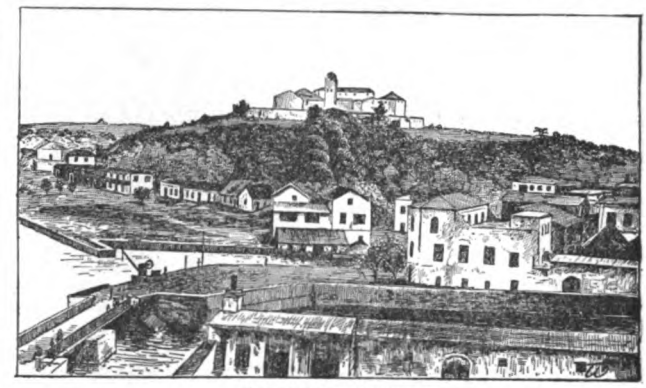
**Gold-Beating.** Preparation of gold-leaf by hammering. A thinness has been attained of 367,500 leaves to the inch, and a grain of gold can be made to cover 52 sq. in. In gold-beating handwork has not yet been displaced by machinery. The metal is rolled into foil, cut into small pieces, placed in a pile with parchment paper between, and reduced in thickness with a flat-headed hammer. The thin metal is again subdivided and hammered in a pile with gold-beaters' skin between. One grain of gold gives 52 sq. in. of leaf.

**Goldberg.** Town of Silesia, once noted for gold mines; scene of battles between the French and the Allies, May 27 and Aug. 23, 1813.

**Gold Bichloride.** $AuCl_2$. Made by treating gold with chlorine. When treated with water it decomposes, forming aurous and auric chlorides.

**Gold Bromides.** Similar to the chlorides.

**Gold Coast.** On Gulf of Guinea, w. Africa; British colony, of bad climate, but some commercial value. Area ab. 15,000 sq. m. The chief towns are Accra, Cape Coast Castle, and Elmina.



Gold Coast, Elmina.

**Gold Cyanide.** AuCN. Aurous cyanide; yellow, microscopic, six-sided tablets, made by treating mercuric cyanide with gold trichloride.

**Gold Dioxide.** $Au_2O_3$. Dark, ochre-yellow, hygroscopic powder; made by treating the metal with aqua regia, the metal being in excess.

**Golden Age.** See AGES OF THE WORLD.

**Golden Ass.** Romance by Appuleius, of 2d century, giving the adventures of a young man who was changed into an ass, but afterward recovered human form.

**Golden Bull.** 1. Edict of Charles IV. of Germany, with seal inclosed in gold case; issued 1356. It settled the law of imperial elections, and restrained the right of private redress. 2. In Hungary, constitutional edict, 1222. It changed the government from absolutism to aristocratic monarchy.

**Golden Calf.** Image erected and worshiped by the Israelites at Mt. Sinai; destroyed by Moses. Ex. xxxii.

**Golden Candlestick.** Seven-branched candelabrum, of solid beaten gold, standing in Holy Place of Hebrew Temple; carried in triumph by Titus, and portrayed on his triumphal arch.

Spoils of the Temple with the Golden Candlestick (from the Arch of Titus).

**Golden Chersonese.** Malay peninsula, once so called from its most important product.

**Golden Club.** *Orontium aquaticum.* Swamp plant of the Arum family, native of e. N. America.

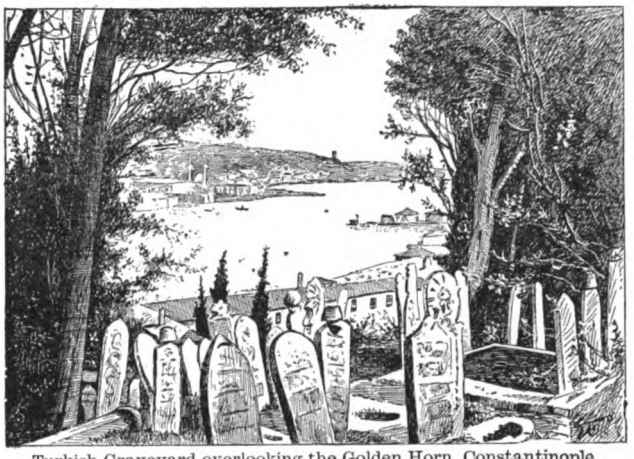
**Golden Fleece.** Hung on an oak in a grove sacred to Ares in Colchis, and guarded by a dragon; brought away by Jason, leader of the Argonauts.

**Golden Fleece.** European order of knighthood; instituted at Bruges 1429 by Philip III. of Burgundy. There are two branches, Spanish and Austrian.

**Golden Gate.** Entrance to the bay of San Francisco; strait ab. five miles long; average width one mile, depth 30 feet on the bar.

**Golden Horde.** Band of Tartars occupying e. Russia and w. and central Asia, who invaded Russia 1240, ravaged Moravia and Hungary 1241, and received tribute from Russia 1243–1477. They were attacked by Timour 1392, and overthrown 1481. See BATU KHAN.

**Golden Horn.** Curved inlet of the Bosphorus n. of Constantinople; so named from the lucrative fisheries at the mouth of the river Lycus.



Turkish Graveyard overlooking the Golden Horn, Constantinople.

**Golden Horseshoe,** KNIGHTS OF THE. Order originating 1716 in an expedition under Gov. Spotswood of Virginia to visit the country beyond the Blue Ridge.

**Golden House.** Palace built by Nero; its roof and walls were of gold, inlaid with mother-of-pearl.

**Golden Legend.** Collection of Lives of the Saints by Jacobus de Voragine, a Dominican, Apb. of Genoa (d. 1298). Very popular in the Middle Ages; tr. into French in 14th century; pub. 1473.

**Golden Number.** That which expresses the place of the year in the Metonic Cycle. It may be obtained by adding one to the number of the year and dividing by 19, the remainder, if any, is the golden number, if there is none 19 is the number, thus $(1889+1)\div19=99-9$ remainder, 9 is the golden number for 1889.

**Golden Rod.** Herbs of the genus *Solidago*, of the Composite family, of wide geographical distribution, very abundant in N. America. The various species can hardly be classed as weeds, since for the most part they are found only in uncultivated land. Occasionally they take possession of worn fields, but they are never troublesome in land sufficiently fertile to grow a fair crop of grass.

Common Golden Rod (a garden variety).

**Golden Rod,** FALSE. *Brachychæta cordata.* Yellow-flowered plant of the Composite family, native of the s.e. U. S.

**Golden Rose.** Blessed by the Pope on 4th Sunday in Lent, and sent as a mark of special honor to some prince; first presented by Urban V. to Joanna of Naples 1366. Isabella of Spain received the rose for her high virtues 1868.

**Golden Spur.** Order instituted 1550 by Pope Paul III.

**Goldfinch.** Birds of family *Fringillidæ.* The American Goldfinch (*Spinus tristis*), or Yellowbird, has this golden color only in the male. There is black on the crown, and white wing bars are present. The female is olivaceous. They are seed eaters, but inoffensive. The European Goldfinch (*Carduelis*) has the sexes alike, the head black and crimson, the body black and brown, marked with white and yellow. It lays 4 or 5 eggs, has two broods a year, and has a pleasing song.

**Goldfuss,** GEORG AUGUST, 1782–1848. Prof. of Zoölogy and Mineralogy at Bonn; author of several scientific works of value. *Petrifacta Germanica*, 3 vols., 1827–34; *Zoölogie*, 1826–34.

**Goldmark,** KARL, b. 1830 in Hungary. Composer of symphonies, concert overtures, chamber music, and operas, eminently *The Queen of Sheba*, 1875.

**Gold Monochloride.** AuCl. Aurous Chloride. Formed by heating anhydrous auric chloride. Treated with water it is converted into auric chloride and gold.

**Gold Monoxide.** $Au_2O$. Aurous oxide; brownish-violet compound, made by heating aurous chloride with caustic potash. With ammonia it forms a violet-colored, explosive compound.

**Gold of Pleasure.** See FLAX, FALSE.

**Goldoni,** CARLO, 1707–1793. Venetian dramatist, noted for his painting of character. He lived for some time at Paris, and wrote largely under French influence, but had great weight at home, and is held the chief of Italian comedians.

**Gold Potassium Cyanide.** AuCN.KCN. Colorless, rhombic octahedra, with a sweet, metallic taste; made by dissolving aurous cyanide or finely-divided gold in potassium cyanide.

**Goldsborough,** LOUIS MALESHERBES, U.S.N., 1805–1877. Captain 1855, Rear-admiral 1862, for capturing Roanoke Island, N. C.

**Goldschmidt,** ADALBERT, b. 1848. Austrian musician. *Seven Deadly Sins*, a cantata, 1876.

**Goldschmidt,** HERMANN, 1802–1866. German-French astronomer, discoverer of many small stars and asteroids.

**Goldschmidt,** MEYER AARON, 1819–1887. Danish journalist and novelist, noted for his treatment of Jewish subjects. *A Jew*, 1852; *The Heir*, 1865.

**Goldschmidt,** OTTO, 1829–1890. German-English musician, pianist to JENNY LIND (q.v.), and her husband 1852.

**Goldsmith,** OLIVER, 1728–1774. Irish author, noted for genius and improvidence. His fame rests upon two poems, *The Traveler*, 1764, and *The Deserted Village*, 1770; a novel, *The Vicar of Wakefield*, 1766; two comedies, *The Good-Natured Man*, 1767, and *She Stoops to Conquer*, 1773; and his *Chinese Letters*, 1760, collected as *Citizen of the World*. His histories of England, 1761, Rome, 1768, and Greece, 1774, were long used as text-books. *Polite Learning in Europe*, 1759; *Life of Beau Nash*, 1760; *Animated Nature*, 1774.

Oliver Goldsmith.

**Goldstücker,** THEODOR, 1821–1872. Born in Germany; prof. of Sanskrit in Univ. Coll., London, from 1852; founder Sanskrit Text Society. *Pânini*, 1861; *Literary Remains*, 1879.

**Gold Sulphate.** $AuSO_4$. Aurous sulphate. Scarlet, lustrous prisms; made by heating gold sponge with iodic and sulphuric acids to 250° C.

**Gold Sulphide.** $Au_2S$. Aurous sulphide. Brown-black powder when dry, steel gray when moist; made by passing hydrogen sulphide into a boiling gold chloride solution.

**Gold Thread.** *Coptis trifolia.* Yellow-rooted herb of the Buttercup family, native of the cooler portions of the n. hemisphere.

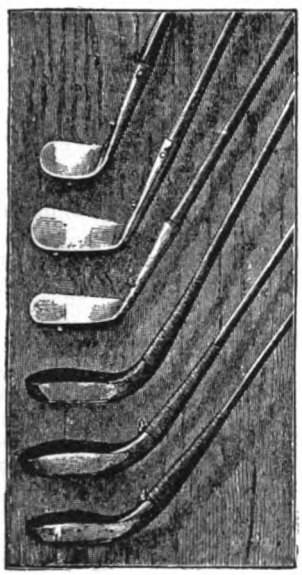
**Gold Trichloride,** or AURIC CHLORIDE. $AuCl_3$. Yellow crystalline solid, made by dissolving gold in aqua regia. When crystallized it contains two molecules of water of crystallization. Treated with stannous chloride it gives a purple-colored precipitate, the Purple of Cassius, a compound of gold, tin, and oxygen. It is used in photography in toning.

**Gold Tricyanide.** $Au(CN)_3+3H_2O$. Auric cyanide. Large colorless leaflets, made by treating the double cyanide of gold and potassium with hydrofluosilic acid; used in gold plating.

**Gold Trihydroxide,** or AURIC HYDROXIDE. $Au(OH)_3$. Yellow or brown powder, obtained by treating auric chloride with caustic soda. It decomposes on exposure to the light, giving off oxygen.

**Gold Trioxide,** or AURIC OXIDE. $Au_2O_3$. Made by heating gold trihydroxide to 100°. Treated with ammonium hydroxide, a brown substance is produced which, when dried, explodes if struck; this is Fulminating Gold.

**Golf.** This sport belongs to the "bat and ball" variety of games, and, although the national game of Scotland, is one of the most fashionable of modern sports in England and the United States. As far back as 1457 the game was played in Scotland with such fervor as to provoke kingly decrees against it on account of its interference with archery. The secret of its popularity then as now lay in the fact that it was adapted to all ages and degrees of athletic development, and its demands were not such as to require a special course of bodily training. The game consists in driving a small ball by successive blows with a variety of clubs, each adapted to its special stroke, over a course usually from three to five miles in extent, punctuated with holes, eighteen in number for the ordinary run, into which the ball is in turn deposited. The object is to hole the ball with the fewest strokes. The links are the downs or heath upon which the game is played, while the course is that portion of the links upon which the game ought to be played, and generally bounded by rough ground or other hazards. The course is usually of a circular character, and the ground of an undulating nature, with hazards of all kinds in the shape of roads, sand dunes, streams, and the like. The ball is made of gutta-percha and the clubs of wood and metal, known according to their shape and purpose.



Club Heads.

The Swing in Driving.

**Goliad Massacre.** In Texas, March 27, 1836, 500 American prisoners were put to death by Santa Anna.

**Goliath.** Philistine champion of gigantic stature, slain by David.

**Golius,** JACOBUS, 1596–1667. Prof. Leyden from 1624. *Lexicon Arabico-Latinum*, 1653.

**Golownin,** VASILI, 1776–1831. Russian naval officer, engaged, 1807–11, in surveying the shores of Asiatic and American Russia, and in an exploring expedition 1817–19: Vice-admiral 1819. *Captivity in Japan*; *Voyage Round the World*, 1822.

**Goltz,** BOGUMIL, 1801–1870. German author, b. in Poland. *Buch der Kindheit*, 1847; *Typen der Gesellschaft*, 1860.

**Gomara,** FRANCISCO LOPEZ DE, 1510–ab.1547. Spanish author, chaplain of Cortés 1540. His *History of the Indies*, 1552–53, narrates the conquest of Mexico and Peru.

**Gomarus,** FRANCISCUS, 1563–1641. Dutch Calvinist, prof. at Leyden 1594–1611, Saumur 1614, and Groningen 1618; opponent of Arminius, and powerful at the Synod of Dort, 1618–19. His followers were called Gomarists or Counterremonstrants.

**Gomorrah.** See CITIES OF THE PLAIN.

**Gomperz,** THEODOR, b. 1832. Prof. Vienna since 1869. *Herculanische Studien*, 1886; tr. J. S. Mill's works, 1869–80.

**Gonad.** Sexual cell; also entire ovary or testis.

**Gonangium.** Chitinous sac inclosing the sporosacs or planoblasts in *Hydromedusæ*.

**Gonçalves Dias,** ANTONIO, b. 1823. Brazilian poet.

**Goncourt,** EDMOND LOUIS ANTOINE HUOT DE, b. 1822. French author. *Society During the Revolution*, 1854–55; *Marie Antoinette*, 1858; *Mistresses of Louis XV.*, 1860. In these, and in several naturalist novels, he was associated with his brother, JULES ALFRED HUOT DE, 1830–1870. *Chérie*, 1884; *Mlle. Clairon*, 1885; *Journal des Goncourt*, 4 vols., 1887–90. They also wrote several plays.

**Gondola.** Long, narrow, flat-bottomed boat with raised prow at each end especially adapted for use on the canals of Venice and some other parts of Italy. It is manned with one or two gondoliers, who propel it with long, single oars.

Gondola.

**Gonds.** One of the most important of the aboriginal tribes of India speaking dialects of the Turanian family. They occupy portions of central India, are totally distinct from the Hindoos, and number ab. 1,500,000.

**Gonfalon.** Old Italian banner with two or three streamers on tails, and affixed to a cross-yard so as to turn like a vane on its standard.

**Gong.** Oriental bronze instrument of percussion shaped like a caldron lid, average diameter 15–20 in. with rim 2–3 in. deep. It is hardly musical, but used for marking time, making signals, and increasing the clangor of martial instruments.

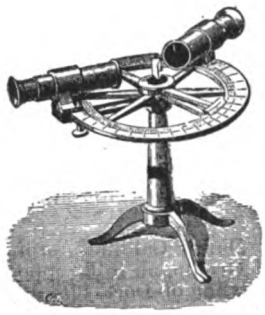
**Gongora y Argote,** LUIS DE, 1561–1627. Spanish lyric poet and romancer.

**Goniatites.** Genus of fossils comprising ancient forms of the *Ammonitidæ* in which the shell is discoidal. Found in the Upper Silurian, but mostly in the Carboniferous.

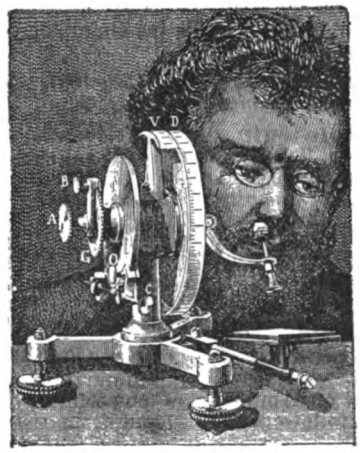
**Gonidia.** Cells that without much specialization can reproduce asexually the organism from which they come.

**Gonids.** Green algal cells which occupy certain portions of the lichen thallus. See also PSEUDOCYSTS. Also various kinds of propagative spores in the *Thallophyta*.

**Goniometer.** Instrument for measuring angles, especially the dihedral angles of crystals. In the reflecting goniometer, devised by Wollaston, the angle of the crystal is measured by noting through what angular distance the crystal must be turned so that the two rays reflected from the two surfaces



Babinet's.



Goniometer. Wollaston's.

successively shall have the same direction. Babinet's goniometer is used for measuring the angles of prisms.

**Goniometry.** Discussion of the relations of angles and their functions: made a part of Trigonometry.

**Gonoblastidia.** Processes that bear the gonophores in hydroids.

**Gonocalycine Canals.** Gastrovascular canals of a gonophore.

**Gonocalyx.** Swimming bell (umbrella) of a hydroid gonophore.

**Gonocheme.** Planoblast which produces gonophores by budding.

**Gonochoristic Reproduction.** Form of gamogenesis in which the sexes are separate or diœcious; opposed to hermaphroditism.

**Gonophore.** Stipe which supports the stamens and pistils of a flower, elevating them above the corolla.

**Gonophores.** Medusa buds of hydroids, whether detached or fixed, which carry the reproductive cells. If the bud becomes free it is termed a gonozoöid.

**Gonoplasm.** Inner part of the protoplasm in the antherid of the *Peronosporeæ*.

**Gonorrhœa.** Acute inflammatory disease of mucous membrane, especially of the urethra in the male and the urethra and endometrium in the female, but also frequently affecting the eye, rectum, and occasionally the nose and mouth. It is due to a specific dipploccus which was definitely determined by Neiser in 1879, and which has an incubation period of from three to ten days. The disease runs a course of about six weeks, but owing to insufficient or incompetent treatment it frequently becomes chronic and may remain in the urethra for an indefinite period. In the female it is apt to ascend along the fallopian tubes to the ovaries and cause very serious difficulties, occasionally resulting in fatal peritonitis. Its treatment consists of injections of mild antiseptics during the acute period, followed later by astringents, and a careful attention to diet and general hygiene.

**Gonosome.** Reproductive portion of a hydroid colony.

**Gonotheca.** Chitinous case inclosing gonophores in certain hydroids.

**Gonozoöid.** See GONOPHORE.

**Gonsalvo de Cordova,** 1453–1515. Spanish general, noted for successes against the Moors 1481–92, the Turks 1500–1, and the French in Naples 1495–96 and 1501–4; Duke of Sesa and Viceroy of Naples; recalled through envy 1507.

**Gonys.** Ventral ridge of lower mandible in birds.

**Gonzaga.** Family of German descent, rulers of Mantua 1328–1700; dukes from 1530. They held other titles.—LUIGI, 1568–1591, was Marquis of Castiglione, but became a Jesuit 1585, died of the plague at Rome while nursing the sick, and was canonized 1756 as St. Aloysius.

Ludovico Gonzaga and his Wife, by Mantegna.

**Gonzaga,** THOMAZ ANTONIO. 1744–1809. Brazilian poet; banished 1792.

**Gonzalez,** MANUEL, 1820–1893. Mexican general; Sec. of War 1878–80; President 1880–84.

**Gonzalez-Vigil,** FRANCISCO DE PAULA. 1792–1876. Peruvian author; Deputy 1825–39; Librarian at Lima from 1836. His works are political and religious.

**Good,** IN ETHICS. That which is to be sought for in moral action; especially so used in ancient discussion as distinguished from the Right of modern ethics.

**Good,** JOHN MASON, M.D., 1764–1827. English author; tr. Lucretius 1805–7. *Study of Medicine*, 4 vols., 1822; *Book of Nature*, 3 vols., 1826.

**Goodale,** ELAINE, b. 1863. Teacher of Indians at Hampton, Va., 1883, and Dakota 1886; wife of Dr. C. A. Eastman, a half-breed, 1891. She and her sister, DORA READ, b. 1866, won poetic repute in childhood. *Apple Blossoms*, 1878; *Verses from Sky Farm* (Mass.), 1880.

**Goodale,** GEORGE LINCOLN, M.D., b. 1839. Prof. Harvard 1878. *Wild Flowers of N. America*, 1882; *Physiological Botany*, 1885; *Useful Plants*, 1891.

**Goodall,** FREDERICK, b. 1822. English painter, R.A. 1863.

**Goode,** GEORGE BROWN, b. 1851. Ichthyologist, connected with the Smithsonian Institute from 1873. *Game Fishes of the U. S.*, 1879; *Fisheries*, 1884.

**Goodell,** WILLIAM, D.D., 1792–1867. American missionary in Syria 1823–28, and at Constantinople 1831–65; ed. Armeno-Turkish Bible 1841–43.

**Goodenovieæ.** Natural family of flowering plants, of the class *Angiospermæ*, sub-class *Dicotyledons* and series *Gamopetalæ*, comprising 12 genera and ab. 210 species, growing in greatest numbers in Australia; found also in New Zealand, the Antarctic regions of America, the Pacific Islands, and tropical Asia.

**Good Friday.** Before Easter; anniversary of Our Lord's Crucifixion, observed from primitive times.

**Good Hope.** See CAPE OF GOOD HOPE.

**Good-King-Henry.** *Chenopodium bonus-henricus.* Weed of the Goosefoot family, native of Europe, introduced in the U. S.

**Goodrich,** CHAUNCEY ALLEN, D.D., 1790–1860. Prof. Yale from 1817; reviser of Webster's Dictionary.

**Goodrich,** JOHN ELLSWORTH, b. 1831. Prof. Univ. Vermont 1872; Librarian 1873–86. *Centennial Oration*, 1892.

**Goodrich,** SAMUEL GRISWOLD ("PETER PARLEY"), 1793–1860. American author or compiler of nearly 200 books, mostly for children.—His brother, CHARLES AUGUSTUS, 1790–1862, wrote *Hist. U. S.*, 1852, and *Lives of the Signers*, 1829.

**Goods.** Goods of the first order are commodities which satisfy wants directly, such as food and clothing; of the second order, such as do not satisfy wants directly, but are used in producing goods of the first order, as flour mills and raw wool for clothing; of the third order, such as are used in producing goods of the second order, as machinery for making milling or weaving machinery.

**Goods and Chattels.** Every kind of personal property, except choses in action.

**Goodsir,** JOHN, 1814–1867. Prof. of Anatomy Univ. Edinburgh 1846; author of valuable papers, collected 1845.

**Goodspeed,** ARTHUR WILLIS, Ph.D., b. 1860. Prof. Univ. Pa. 1889.

**Good Templars.** Secret society of total abstainers, founded in N. Y. 1852, reorganized 1855; founded in England 1868.

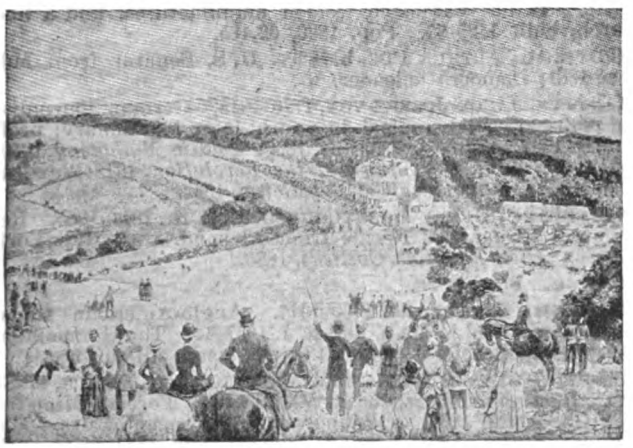
**Good Will.** Property right connected with an established business, founded upon the tendency of customers to return to a particular place for trade.

**Goodwin,** DANIEL RAYNES, D.D., LL.D., 1811–1890. Prof. Bowdoin 1838–53; Pres. Trinity Coll., Hartford, 1853–60; Provost Univ. Pa. 1860–68; Prof. P. E. Divinity School, Phila., from 1862. *Eschatology*, 1885.

**Goodwin,** WILLIAM WATSON, LL.D., b. 1831. Prof. Harvard since 1860; first director American School at Athens 1882–83; Pres. Philological Assoc. 1872–85. *Greek Grammar*, 1870–79; *Moods and Tenses*, 1869–90.

**Goodwin Sands.** In Strait of Dover, 5½ m. from e. coast of Kent; 10 m. long; cause of many wrecks, in spite of lightships and beacons.

**Goodwood.** Seat of the Duke of Richmond, near Chichester, Sussex, England, with a beautiful park and fashionable



Goodwood—Panoramic View of Racecourse and Surrounding Country.

racecourse established 1802. The races are held at the end of the London season in July.

**Goodyear,** CHARLES, 1800–1860. American manufacturer, inventor of vulcanized rubber 1844.

**Goodyear,** WILLIAM HENRY, b. 1846. Lecturer on Art, Teachers' Coll., 1894. *Ancient and Modern History*, 1885; *History of Art*, 1887; *Grammar of the Lotus*, 1891; *Roman and Mediæval Art*, 1893; *Renaissance and Modern Art*, 1894.

**Googe,** BARNABY, ab.1540–ab.1600. English poet, reprinted 1871.

**Goorkhas,** or GURKHAS. Mongol race in Nepaul, India,

A Goorkha Outpost.

which they conquered 1768. They furnish excellent troops to the Anglo-Indian army.

**Goose.** Child's game played in almost every country in Europe under this name, upon a board marked with numbered stations according to the throws with dice. In Japan it is known as Sugoroku, and it is known almost throughout the world, even among savage people, from whom its origin is seen to be cosmical and divinatory. The Korean game of Nyout, and the Aztec game of Patolli, may be regarded as independent yet similar forms of this game.

**Goose.** See ANSERINÆ.

**Gooseberry.** Shrubs of section *Grossularia* of the genus *Ribes*, bearing edible berries; natives of the n. hemisphere. The forms most commonly cultivated are derivatives from the European *R. grossularia*.

**Gooseflesh.** Roughened appearance of the skin, caused by the contraction of the small muscles connected with the hairs and a consequent erection of the latter.

**Goosefoot.** Herbs of the genus *Chenopodium*, natural family *Chenopodiaceæ*, of wide geographical distribution, many of them introduced as weeds into the U. S.

**Goose Grass.** See CLEAVERS and KNOT GRASS.

**Goose Lake.** In n. Cal. and s. Oregon, on the head waters of the Sacramento, here called Pitt River. Area 201 sq. m.

**Gopher Drift.** In w. U. S., irregular passage opened in search for ore.

**Gophers.** Squirrel-like rodents of the family *Geomydæ* of the *Sciuromorpha*. They are burrowers in the earth, digging like moles, which they resemble in having soft, dense fur, small ears and eyes, short tail, and powerful claws on the forefeet. They are usually larger than rats and very numerous in w. U. S. Some have enormous cheek pouches for storing food, which consists mainly of bulbous roots. Ground squirrels of the West and a burrowing turtle in the s. Atlantic States are called Gophers. In the South *G. tuza* is called a Salamander.

**Gopher Wood.** Used in constructing the Ark, and supposed to be *Cupressus sempervirens*, common cypress. Others variously consider it to be squared or planed wood, or cedar, or pitched wood.

**Gorakhpur,** or GORUCKPORE. Capital of a district in British India; on the Rapti, 430 m. n.w. of Calcutta. Pop., 1891, 64,860.

**Gordiacea** (GORDIIDÆ). Group of nemathelminth worms, sometimes known as hair worms or rain worms. The alimentary canal of the adult is rudimentary; the tail of the male is forked. They pass their larval period as parasites of insects. When ready to reproduce they make their way into water. The hatched young bore into the aquatic larvæ of such insects as the Ephemerids, and there become encysted. These are eaten by other insects, such as aquatic beetles; the cysts dissolve, setting the parasites free. They return to the water when about to become sexually mature and the cycle is completed. *Gordius* is an example.

**Gordian Knot.** Gordius, a peasant, became King of Phrygia. The car on which he was riding when proclaimed king was dedicated to Zeus and kept in his temple at Gordium. An oracle declared that whoever should untie the knot which bound the yoke to the tongue of the car should become lord of Asia. Alexander the Great, failing to untie the knot, cut it with his sword 333 B.C.

**Gordianus,** MARCUS ANTONIUS.—I., "AFRICANUS," 158–238. Twice Consul; Proconsul of Africa 232; Emperor 238, with his son, II., 192–238.—III., his grandson, 222–244, Emperor 238.

**Gordon,** ADAM LINDSAY, 1833–1870. Australian poet.

**Gordon,** CHARLES GEORGE, 1833–1885. English officer, in the Chinese service 1863–64, when he aided in suppressing the Tai-Ping rebellion; Gov.-gen. of the Soudan 1874–77; killed at Khartoum.

**Gordon,** JOHN BROWN, b. 1832. Lieut.-gen. C.S.A. 1864–65; U. S. Senator 1873–80 and since 1891; Gov. of Ga. 1887–91.

**Gordon,** SIR JOHN WATSON, 1788–1864. Scottish portrait painter, knighted 1850, R.A. 1851.

**Gordon,** JULIEN. See CRUGER, MRS.

Gordianus III. (Vatican Gallery).

**Gordon,** LADY LUCIE (AUSTIN), 1821–1869. English translator of German and French books, sometimes with her hus-

band, Sir Alexander Duff. *Letters from the Cape*, 1862; *Letters from Egypt*, 1863–75.

**Gordon,** PATRICK, 1635–1699. Scottish officer, in the Russian service from 1661; Major-gen. 1677, Lieut.-gen. 1683, Gen. 1688.

**Gordon-Cumming,** CONSTANCE FREDERICA, b. 1837. Scottish traveler. *In the Himalayas*, 1876; *Fiji*, 1881; *China*, 1886–88.

**Gordon Riots.** In London, June 2–7, 1780. About 50,000 rioters marched to the House of Commons to demand the repeal of the R. C. Relief Bill. They sacked and burned many

Gordon Riots.

buildings. Lord George Gordon, 1750–1793, head of the "No-Popery" party and leader of the mob, was tried for high treason, but acquited 1781: 450 of the rioters were killed or wounded by the soldiery, and 135 were tried, of whom ab. 65 were convicted and 21 executed.

**Gore,** MRS. CATHERINE GRACE (MOODY), 1799–1861, m. 1823. English novelist and dramatist. *Lettre de Cachet*, 1827; *Cabinet Minister*, 1839; *Cecil*, 1845.

**Gore,** CHRISTOPHER, LL.D., 1758–1827. Gov. of Mass. 1810; U. S. Senator 1813–16; founder of Gore Hall at Harvard.

**Gore,** GEORGE, LL.D., F.R.S., b. 1826. English electrician. *Electro-Metallurgy*, 1877; *Electro-Chemistry*, 1885.

**Gorgas,** FERDINAND, M.D., b. 1834. Prof. Baltimore Dental Coll. since 1860; writer on Dental Science.

**Gorge.** Side of an outwork nearest the main work, which can be fired into and made untenable in case of its capture. To prevent sudden surprise it is closed by a stockade.

**Gorged.** In Heraldry, applied to any animal wearing a collar, often in the form of a coronet.

**Gorgei,** ARTHUR, b. 1818. Hungarian general in the revolt of 1848. As commander-in-chief he routed the Austrians April 26, 1849; as dictator he surrendered to the Russians Aug. 13, and was accused of treachery by Kossuth. To this he replied in a book pub. 1851.

**Gorges,** SIR FERDINANDO, ab. 1565–1647. Father of colonization in New England; chief former of the Plymouth companies 1606 and 1620; sender of several futile expeditions; proprietor of Maine by charter of 1639. His grandson sold this claim to Mass. 1677 for £1,250.

**Gorget.** Metal protection at the joint of the helmet and breast-plate; also a female neck-covering.

**Gorgias,** d. ab. 380 B.C. Rhetorician and sophist; famous for the doctrine (1) that there is no real existence, (2) that if there were it could not be known, and (3) that if known nothing could be said about it. Of his work on *Nature or the Non-Existent*, fragments remain. Plato attacked him in the dialogue *Gorgias*.

**Gorgonidæ.** Family of *Alcyonaria*, including fixed, branching colonies, with horny axis (sometimes calcareous as in Red Coral), covered with a friable crust. Seafans and the Red Coral of commerce are examples. In Seafans the branches grow all in one plane, at right angles to the tidal currents, to allow each minute polyp an equal chance at the food. The branches are united by numerous anastomoses.

**Gorgons.** Three frightful winged maidens, with serpents for hair and claws of brass. Of these only Medusa was mortal, but so hideous of face as to turn the beholder to stone. She was slain by Persius, and her head placed in the center of the ægis of Athena.

Gorgon (Antique Gem).

**Gorham Case.** For denying baptismal regeneration, Bp. Phillpotts of Exeter refused to institute Geo. C. Gorham to a vicarage in Devon, and was sustained 1849 by the Court of Arches. The Privy Council reversed the judgment 1850.

**Gorilla.** See TROGLODYTES GORILLA.

**Görlitz.** City of Silesia, Prussia, on the river Neisse. It has extensive woolen manufactures, and a fine church, built 1423–97. Pop. 1890, 62,135.

**Gorman,** ARTHUR PUE, b. 1839. U. S. Senator from Md. since 1881; Democratic leader.

**Görres,** JAKOB JOSEPH VON, 1776–1848. German journalist and political writer, radical in youth, later reactionary; prof. Munich 1827. *Popular Legends*, 1806; *Asiatic Mythology*, 1810; *Lohengrin*, 1813; *Germany and the Revolution*, 1819; *Swedenborg*, 1827; *Athanasius*, 1838; *Mysticism*, 1842.

**Gorringe,** HENRY HONEYCHURCH, U. S. N., 1841–1885. Remover of Cleopatra's Needle from Alexandria to New York 1879–80. *Hist. Egyptian Obelisks*, 1885.

**Gorse.** See FURZE.

**Gorton,** SAMUEL, ab. 1600–1677. Anglo-American schismatic, persecuted in Mass. and R. I. 1637–44. The Gortonians, a perfectionist sect rejecting all forms, lasted till ab. 1750.

**Gortschakoff,** ALEXANDER MICHAELOVICH, PRINCE, 1798–1883. Russian Ambassador at Vienna 1854; Foreign Minister 1856; Chancellor 1863; long a power in European affairs.—His brothers, PETER, 1790–1868, and MICHAEL, 1795–1861, were eminent generals.

**Gortyna.** Ancient city of Crete, near Mt. Ida. A local code of great antiquity was found here 1884.

**Görz,** or GORITZ. Old town of Austria, 25 m. n.w. of Trieste. Pop., 1890, 21,888.

**Goschen,** GEORGE JOACHIM, b. 1831. M. P. 1863; English political economist, member of several cabinets; Chancellor of the Exchequer 1887. *The Theory of Foreign Exchange*, 1863.

**Goshen.** Pasture-land in e. Delta of the Nile, in which the Israelites dwelt for generations, subject to Egypt.

**Goslar.** Town in Hanover, founded 920; free imperial city

The Kaiserworth and Rathhaus, in the Market Place, Goslar.

till 1802; site of a palace erected by Henry III. 1050, restored 1867–80, and of other Mediæval buildings. Pop., 1890, 13,311.

**Goslarite.** $ZnSO_4+7H_2O$. Natural hydrous zinc sulphate or zinc vitriol, occurring in a few places as the result of oxidation of zinc ores containing sulphur.

**Gosnold,** BARTHOLOMEW, d. 1607. English seaman who took colonies to Mass. 1602, and Jamestown, Va., 1606.

**Gospel.** Tidings of redemption through Christ.

**Gospels.** First four books of N. T., narratives of the life of Our Lord, according to Matthew, Mark, Luke, and John. The Apocryphal Gospels date from the 2d century or later, and are of little value.

**Gosport.** Fortified seaport in Hants, England, connected by a bridge with Portsmouth across the harbor. It contains Haslar, the great naval hospital. Pop., 1891, 25,400.

**Gossaert,** JAN DE, ab. 1499–1562. Flemish painter.

**Gossamer.** Filamentous substance produced by small spiders and filling the atmosphere during fine weather in autumn or spread over the ground loaded with dew-drops, of which spiders are known to drink. In folk-lore regarded as shreds of the Virgin Mary's neckcloth which she cast away at the time of her assumption.

**Gossan.** Upper portion of a mineral vein that has been altered by percolating waters; generally red in color from the presence of iron; also called Iron Hat. Compare COLORADOS.

**Gosse,** EDMUND WILLIAM, b. 1849. English essayist, poet, and dramatist, biographer of Gray, Raleigh and Congreve 1882–88. *Northern Studies*, 1879; *Shakespeare to Pope*, 1885; *Hist. 18th Century Literature*, 1889; *Secret of Narcisse*, 1892.

**Gossec,** FRANÇOIS JOSEPH, 1734–1829. Flemish musician, whose career was made in Paris. He was among the first of symphony and string quartet composers, founder of the Concert des Amateurs, 1770, reorganizer of the Concerts Spirituels, assistant director of the Grand Opéra, general director of the Ecole Royale de Chant. He composed 26 symphonies and a number of operas.

**Gosselin,** PASCAL FRANÇOIS JOSEPH, 1751–1830. French antiquarian, writer on ancient geography; Academician 1790.

**Gossner,** JOHANNES EVANGELISTA, 1773–1858. Priest at Munich; pastor at Berlin 1829–46; founder of a society which supports some 30 missionaries in India; author of several devotional books.

**Got,** FRANÇOIS JULES EDMOND, b. 1822. Actor of the Comédie Francaise since 1844, societaire 1850; Knight of the Legion of Honor 1881.

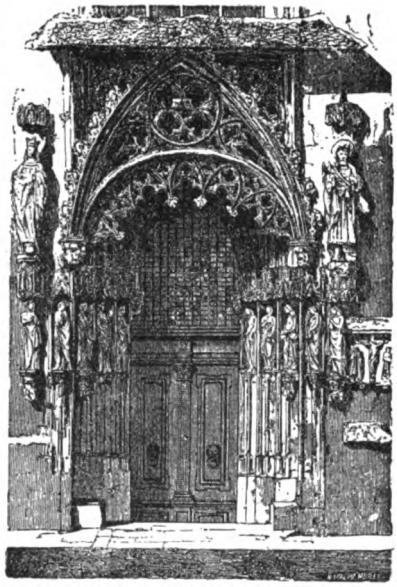
**Gotha.** Capital (with Coburg) of Saxe-Coburg-Gotha; noted for its literary and scientific institutions and its art collections.

Gotha.

Pop., 1890, 29,134. The *Almanach de Gotha*, pub. annually since 1764, is widely known.

**Gotham,** TALES OF THE MEN OF. Collection of facetiæ, pub. ab. 1550, reflecting on the inhabitants of a village 7 m. s.w. of Nottingham. New York was jocosely called "Gotham" in Irving's *Salmagundi*.

**Gothic Architecture.** Style of building that prevailed in western Europe from the 13th century, until it was displaced by the revived classic. Gothic was originally applied to this architecture as a term of reproach, and for that reason Pointed and Christian have been suggested as substitutes, but neither has gained any general currency. The term Gothic is, however, in common usage, applied to buildings with pointed arches, which are commonly regarded as the badges of the style. This usage is reasonably correct, although the pointed arch was an incident in the development of the vaulted construction which really constitutes Gothic architecture and distinguishes it from the preceding Romanesque. In the treatment of intersecting vaults, the use of arches of the same height and of different spans often became compulsory, and such a union could not be managed without awkwardness by the use of the semicircular arch which had been the form exclusively employed by the Romanesque builders. That the builders who transformed the Romanesque construction of vaults resting on continuous walls to the Gothic construction of vaults sustained by isolated points of support were not actuated by a preference for the pointed form of arch is sufficiently proved by the fact that in early Gothic, after the arches of the vaulting system had been pointed in conformity with theoretical requirements, round arches in many cases continued to be employed in the openings of the walls (windows and doors). The Gothic system arose in France, where its beginnings have been traced to the last quarter of the 11th century; but the earliest building in which it was really developed is commonly held to be the abbey church of St. Denis near Paris (1140). During the first half of the following century the great Gothic cathedrals of France were built, and these were imitated, with local variations, in England, Germany, Spain, and Italy. See ARCHITECTURE.



The Bride Porch of St. Sebald in Nurnberg.

**Gothic Art.** Ab. 1200–1600. It yielded sensibly at many points to Renaissance style as early as 1500 in n. Europe, and disappeared entirely in Italy after 1400. The sculpture was wholly architectural in use and treatment, and hence limited in the development of scientific accuracy or formal beauty, but was of wonderful beauty from the standpoint of architectural relations in cathedral portals, etc. Stained glass windows were the most important field of surface design outside of Italy, where fresco took their place.

Jesus Disputing with the Doctors:
Window at Saint Urbain de Troyes, ab. 1295.

**Gothic Language.** Containing the oldest literature of the Germanic tongues, Gothic is of supreme philological im-

portance. Its oldest elements are (1) Runic inscriptions on weapons; (2) words borrowed by other languages; (3) chief of all, the West-Gothic translation of the Bible, made in the 4th century by Bp. Ulfilas and partially preserved; (4) the *Skeireins*, a biblical commentary; and (5) a calendar and some East-Gothic signatures. Characteristics of the language are sonorousness, full inflexions, and an independent passive voice.

**Goths.** People who dwelt s. of the Baltic, invaded Dacia before 200, were checked by Decius 251, pillaged Athens 262, and were defeated by Claudius, Aurelian, and Constantine. A section settled in Mœsia, and were converted by Ulfilas ab. 340–380. The Visigoths began to wander from the Danube ab. 400, invaded Greece, then Italy under Alaric, pillaged Rome, and set up an extensive empire in s. France and n. Spain. The n. section was conquered by Clovis 507, the s. wiped out of existence as a nation by Saracens 711. The Ostrogoths attempted to cross the Danube 386, accompanied Attila into Gaul, and fought the Visigoths 452, and settled in Pannonia. Under Theodoric, 475–526, they wrested several provinces from the Eastern Empire, overran Italy 493, and held it with Ravenna for capital, and the Rhone and Danube for n. boundaries. Their empire was crushed by armies of the Eastern Empire under Belisarius and Narses, and their name disappears 553.

**Gottenburg**, or GOTHENBURG. Commercial city of Sweden, at the mouth of the river Gota, on the Cattegat; founded 1618;

Gottenburg.

important chiefly since 1806. Its noted Licensing System dates from 1865. Pop., 1890, 104,657.

**Gottfried** OF STRASSBURG, d. ab. 1220. Minnesinger, author of the epic *Tristan*, used by Wagner.

**Göttingen.** Town of Hanover, on the Leine. Pop., 1890, 23,689. Its university, founded by George II. of England 1734–37, suffered much from the expulsion in 1837 of seven eminent professors for political reasons. It has a library of 550,000 vols. and 5,000 MSS., ab. 120 instructors, and (1895) 843 students.

**Gottschalk,** ab. 806–868. German monk, intense predestinarian; twice whipped 848, and by Abp. Hincmar of Rheims imprisoned till his death.—Another G. became King of the Wends 1043, and attempted to Christianize his people, who killed him 1066.

**Gottschalk,** ALEXANDRE, b. 1832. French civil engineer.

**Gottschalk,** LOUIS MOREAU, 1829–1869. American pianist, and composer of Salon pieces, in some of which he used Spanish-American themes.

**Gottschall,** RUDOLF VON, b. 1823. German poet, dramatist, novelist, and essayist. *Mazeppa*, 1859; *Portraits and Studies*, 1870.

**Gottsched,** JOHANN CHRISTOPH, 1700–1766. Prof. Leipzig 1730; translator of French plays, and author of *The Dying Cato*, 1730. As a critic he attempted to reform the German drama on French models, and carried great influence for a time.

**Götz von Berlichingen,** 1480–1562. German robber-knight, outlawed 1512 and 1516; leader in the Peasants' War 1525; imprisoned till 1540; soldier in Hungary 1542, and France 1544; celebrated in an autobiography pub. 1731, and in Goethe's drama.

**Gouda.** Town of Holland on the Yssel, with manufactures of pipes, pottery, and celebrated cheese. Pop., 1894, 20,000.

**Goudimel,** CLAUDE, 1505–1572. Flemish composer; founder of the Roman School; teacher of Palestrina, Nanini, Animuccia, and other masters; victim of the Massacre of St. Bartholomew in Lyons. He set the melodies of the versified Psalms by Marot and Beza for four voices.

**Gouge.** Soft, clayey streak in a mineral vein. Compare SELVAGE.

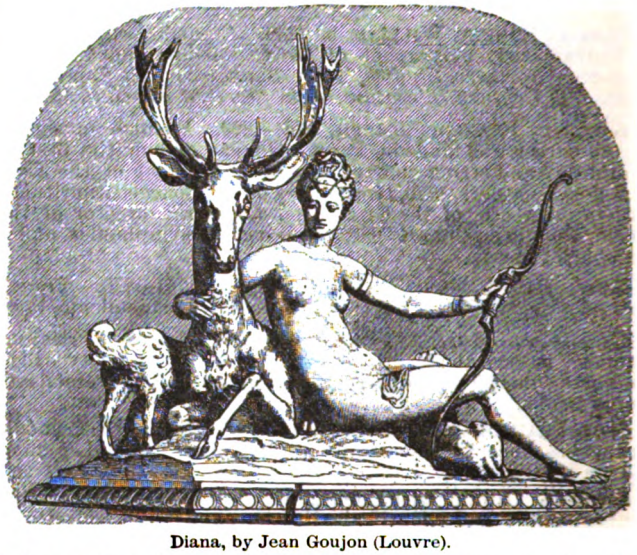
**Gough,** BENJAMIN, 1805–1877. English hymnist. *Lyra Sabbatica*, 1865.

**Gough,** HUGH, VISCOUNT, 1779–1869. Irish general in China 1838–42, and in India, where he defeated the Mahrattas 1843, and the Sikhs 1845 and 1848–49; Baronet 1842; Baron 1846; Viscount 1849; Field-marshal 1862.

**Gough,** JOHN BARTHOLOMEW, 1817–1886. Anglo-American lecturer, most eloquent of temperance advocates. *Autobiography*, 1846–70.

**Gough,** RICHARD, 1735–1809. English antiquarian; ed. Camden's *Britannia*, 1789; *Sepulchral Monuments*, 1786.

**Goujon,** JEAN, d. ab. 1572. Greatest French sculptor of his time. Like all French Renaissance artists, he reflected the



Diana, by Jean Goujon (Louvre).

Italian style and influence, but with much independent native genius. His best known works are *Diana* and reliefs from the Fontaine des Innocents, in the Louvre.

**Goulburn,** EDWARD MEYRICK, D.D., D.C.L., b. 1818. Dean of Norwich 1866–89; author of *Resurrection of the Body* (Bampton Lectures), 1851; *Personal Religion*, 1862; and other doctrinal and devotional books.

**Gould,** AUGUSTUS ADDISON, M.D., 1805–1866. Naturalist, writing chiefly on mollusks. *Invertebrata of Mass.*, 1841.

**Gould,** BENJAMIN APTHORP, LL.D., b. 1824. Founder *Astronomical Journal*, 1849–61, resumed 1886; connected with U. S. Coast Survey 1851; first director Dudley Observatory at Albany 1856–59; founder of the National Observatory of the Argentine Republic and its director till 1884; founder of the Argentine Meteorological Office, and author of its Annals, vols. i.-viii. His observations have been pub. in 14 quarto vols.—His father, same name, 1787–1859, was the first Amer. editor of classical authors.

**Gould,** JAY, 1836–1892. American financier, controlling the Erie and other railroads. His estate was estimated at over $70,000,000.

**Gould,** JOHN, 1804–1881. English ornithologist. *Birds of Europe*, 1832–37; *Birds of Australia*, 7 vols., 1840–48; and others, 43 vols. in all.

**Gounod,** CHARLES FRANÇOIS, 1818–1893. French composer, whose masterpiece is *Faust*, 1859. His other operas are *Sapho*, 1851; *La Nonne Sanglante*, 1854; *Le Médecin malgré lui*, 1858; *Philémon et Baucis*, 1860; *La Reine de Saba*, 1862; *Mireille*, 1864; *La Colombe*, 1866; *Roméo et Juliette*, 1867; *Cinq Mars*, 1877; *Polyeucte*, 1878; *La Tribut de Zamora*, 1881. He composed two oratorios: *The Redemption*, 1882, and *Mors et Vita*, 1885.

**Gourd.** Fruit of various climbing plants of the natural family *Cucurbitaceæ*.

**Gourd,** BOTTLE. Large vine of the *Cucurbitaceæ*, bearing fruit 5 or 6 ft. long.

**Gourgues,** DOMINIQUE CHEVALIER DE, 1530–1593. French soldier, who in 1567 avenged the massacre of Huguenot colonists in Florida by Spaniards.

**Gourko,** JOSEPH VASILIVICH, b. 1828. Russian general, eminent in the war with Turkey 1877–78; Count 1878.

**Gournay,** VINCENT DE, 1712–1759. French political economist, of the physiocratic school; author of the formula: *Laissez-aller.*

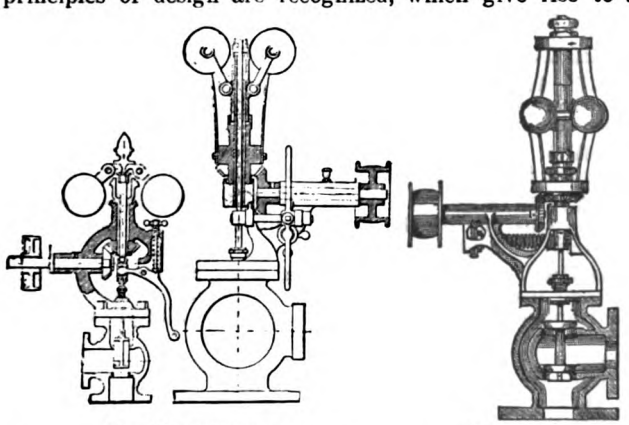
**Gout.** Constitutional disease, often inherited, due usually to excesses in eating and drinking, which, in a typical acute attack, consists in violent pain in and swelling of the first joint of the great toe and more or less fever, lasting for a week or so. When chronic other joints are involved and become deformed on account of deposit of urates in their vicinity. Alkalies, purgatives, and colchicum usually cut short an acute attack; abstinence from starchy or sweet foods, sweet wines and malt liquors will aid in preventing their recurrence. Gouty habit, or Lithæmia, depends, like true gout, upon an excess of uric acid in the system, and may be characterized by cirrhosis of the liver or kidneys, high colored and irritating urine, cystitis, eczema, boils, headache, pains in the joints, and a host of vague symptoms. Without being dangerous or sufficient to incapacitate, it is a most distressing condition and is extremely common. Avoidance of the above mentioned articles, active exercise, life in the open air, and alkalies such as lithia or soda, are the measures best calculated to combat it.

**Govan.** Suburb of Glasgow. Pop., 1891, 61,364.

**Government.** Political and legal machinery by means of which the State exercises its powers.

**Government Intervention.** Action of the legislative or administrative branch of government in either passing laws intended to divert industry from the direction it would take if left only to the effects of unguided competition, or itself making a monopoly of, or taking into its control, some form of economic activity.

**Governor.** Device for controlling the speed of a motor. It may act on the supply of steam to the distributing valves by diminishing its pressure, throttling governors; or direct upon the distribution valves, varying the point at which admission of steam to the cylinder shall cease, cut-off governors. Isochronous governors are those which will keep or bring back the engine to a given speed under all variations of load, from nothing to the maximum. This may be sought by transmitting the effort of the engine to overcome the resistance through a system of springs in the driving wheel on the shaft, which becomes also the governor. The more usual plan is to allow variation in the load to affect the speed of the engine, and this variation in speed to affect the steam supply. Two general principles of design are recognized, which give rise to the



Throttling Governor. Pickering Governor.

classes Centrifugal and Resistance governors. In the former, with vertical axis, a conical pendulum revolves, and as the speed increases, the balls rise, and their rise shuts off steam supply, and vice versa. Where the weight of the balls alone is depended on to balance centrifugal force (Watts' type), the governor is sluggish and less nearly isochronous than when the balls are made light, and the power of the governor to move the valve is derived either from an axial weight (Porter type), or from springs (Water's and Pickering type). The more usual centrifugal governor in the high-speed engines of to-day is the type in which the weights revolve in a vertical plane, around a horizontal axis, which is the driving shaft of the engine. The resistance to centrifugal force is given by springs, and isochronism is sought by the method in which the levers are pivoted. This type of governor has the advantages of direct and simple connection to the driving mechanism, and the running away of the engine from breakage of belt is less likely. The resistance type of governor causes the adjustment of the steam valve to follow the change of resistance which is offered by change of speed to the motion of a paddle-wheel or propeller in oil. In the paddle-wheel type the wheel turning in oil tends to carry the oil round with wheel. The oil tends to turn its enveloping casing; this tendency is opposed by a weight, which also adjusts the steam opening. In the propeller type, the oil tends to thrust the spindle lengthwise, with a force which is a function of the speed. This tendency again is opposed by a weight, and serves to adjust the steam opening.

**Governor's Island.** In New York harbor; first fortified 1614; headquarters of Dept. of the East, U.S.A., and site of an ordnance depot.

**Gow,** NEIL, 1727–1807. Scottish violinist, composer of many tunes, as was also his son, NATHANIEL, 1766–1831.

**Gowen,** FRANKLIN BENJAMIN, 1836–1891. Pres. Phila. and Reading R. R. 1869–81. In 1876 he secured the conviction of several "Molly Maguires" for murder, and broke up the society, which had long terrorized the Pa. coal region.

**Gower,** JOHN, ab. 1325–1408. English poet. He wrote *Speculum Meditantis* (not extant) in French, *Vox Clamantis* in Latin, and *Confessio Amantis* in English. The latter has 30,000 lines.

**Gown.** Originally full outer female garment, long-sleeved and close at the throat. Men wore gowns in the 14th and 15th centuries, green being the favorite color with knights. The fashion still lingers in legal and clerical costume. Many sumptuary edicts strove to restrict velvet gowns to the female aristocracy.

**Gowrie Plot.** Conspiracy against James VI. of Scotland by Ruthven, Earl of Gowrie, and others, Aug. 5, 1600, at Gowrie House, Perth. The earl and his brother were slain.

**Goya y Lucientes,** FRANCISCO, 1746–1828. Spanish painter, whose distinction is emphasized by the fact that he lived in a period not marked by great art, least of all in Spain.

**Goyaz.** Central province of Brazil between the Tocantins and Araguay rivers; area 288,546 sq. m. It produces gold, iron, diamonds, mica, copper, and chromite. Pop., 1888, 211,721.

**Goyen,** JAN VAN, 1596–1656. Dutch landscape and marine painter of great distinction.

**Gozo.** Island in the Mediterranean 4 m. n.w. of Malta; area 20 sq. m. It has a rich soil, well cultivated. The chief town, Rabat, is near the center. Pop. 1891, 18,553.

**Gozzi,** CARLO, COUNT, 1722–1806. Venetian dramatist, rival of Goldoni. *Memoirs*, 1797; *Works*, 14 vols., 1802.—His brother, GASPARO, 1713–1786, was a noted journalist and essayist. *Works*, 22 vols., 1812.

**Gozzoli,** BENOZZO, 1424–1498. Florentine painter of naive talent, often quaint, always interesting; certain figures in his fresco of the Story of Noah in the Pisan Campo Santo are unsurpassed. Other important frescoes are there, and at San Gemignano in Tuscany.

Triumph of St. Thomas Aquinas (Louvre), by B. Gozzoli.

**Graaf,** REGNIER DE, 1641–1673. Dutch anatomist. *De Natura et Usu Succi Pancreatici*, 1663; *Opera*, 1677.

**Graafian Follicles** (or VESICLES). Discovered 1672 in the ovary. Each contains an ovum.

**Graal,** HOLY, or SANGREAL. Vessel used by Christ in instituting the Eucharist; supposed to have been taken to Britain by Joseph of Arimathea; sought by King Arthur's knights. The legend dates from ab. 1160.

**Gracchanus,** MARCUS JUNIUS, 2d century B.C. Roman author of a work on political history, cited by Cicero.

**Gracchus,** TIBERIUS SEMPRONIUS, ab. 168–132 B.C. Tribune of the people at Rome 133 B.C.; active in promoting pop-

ular reforms, especially as to tenure of land; assassinated at an election by P. Scipio Nasica.—His brother, CAIUS SEMPRONIUS, 159–121 B.C., tribune 123 and 122, carried still greater reforms in opposition to the Senate, which craftily undermined his influence, and was slain with many of his friends.

**Grace.** God's mercy to men through Christ. Theologians have distinguished certain varieties, as common, special, antecedent, co-operating, and irresistible.

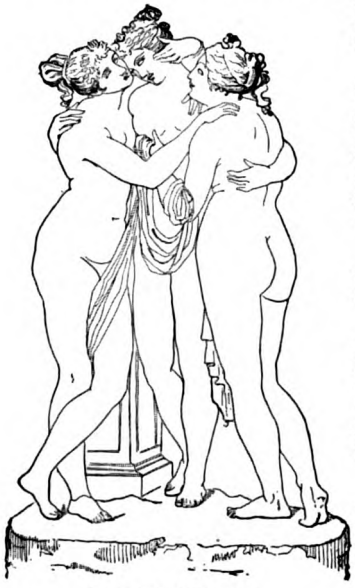
**Grace.** Title assumed by Henry IV. on his accession 1399; extended to Excellent Grace by Henry VI. 1425. The king was so addressed till James I. acceded 1603, when Majesty was substituted. Now Dukes and Archbishops are addressed Your Grace.

**Grace,** MEANS OF. Especially the Bible and sacraments; secondarily, prayer, public worship, all devout exercises and actions.

**Grace before Meat.** Brief prayer or thanksgiving at meals.

**Grace Hoops.** A game somewhat like grace hoops is played by the women of the Tarahumare Indians in Chihuahua in n. Mexico, using straw rings which are tossed and caught on slender sticks. The game does not appear to be known in e. Asia. In Germany, where the game is called Ring-throwing, each player has but a single stick, as among the American Indians.

**Graces.** Aglaia, Thalia, and Euphrosyne, daughters of Zeus; friends of the Muses, with whom they dwelt on Olympus.



Graces (by Canova).

**Gracian,** BALTASAR, 1591–1658. Spanish Jesuit, author of an allegory, *El Criticon; Manual of Prudence*, and other prose works. —His brother, LORENZO, d. ab. 1652, is often confounded with him.

**Gradarii.** Walking legs of birds, usually feathered as far as the heel.

**Grade.** Slope or inclination of a road or railroad. It is expressed in feet per mile, or in per cent of vertical rise to length. Thus, a grade of 52.8 ft. per mile is a 1 per cent grade.

**Grade.** Result of the union of one thoroughbred parent and one parent of native or mixed blood. Where the proportion of improved blood is more than half, the animal is said to be high grade. The first cross is a half blood, the second three-quarter blood.

**Gradient.** Rate of change; expressed in hydraulics as fall of so many inches to the mile, but in meteorological barometry as so many millimeters of pressure per degree of a great circle or so many hundredths of inches per quarter of a degree, and in meteorological thermometry as so many degrees of temperature per degree of a great circle or 60 geographical miles. A vertical gradient in meteorology is the rate of change of temperature, pressure, etc. (in degrees or millimeters), per 100 feet or meters of vertical ascent.—In Engineering, same as grade, but generally applied to water surfaces. See HYDRAULIC GRADIENT.

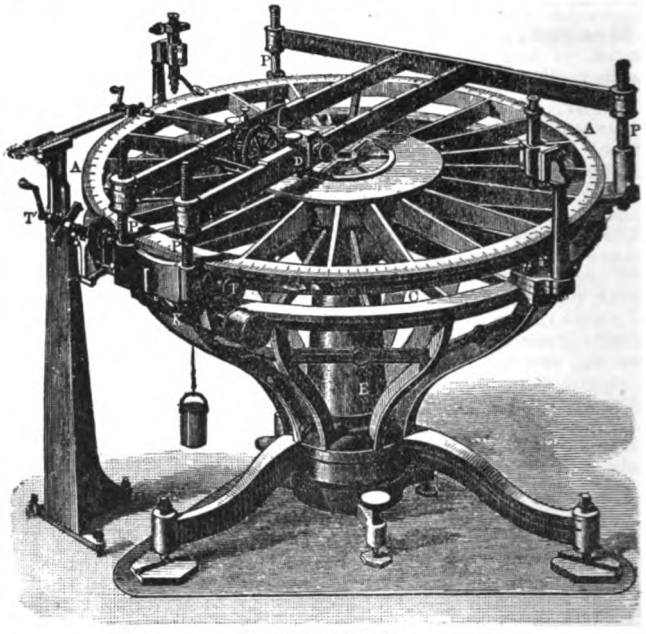
**Grading.** Operation of bringing the bed of a road or railroad to the proper grade by construction of embankments and excavation of cuts. This item constitutes nearly one-third of the total cost of railroad construction.

**Gradual** (*Responsorium graduale*). Responsive, or antiphonal, anthem sung between the Epistle and Gospel at High Mass; so called because in early days it was chanted by a priest standing on the steps (*in gradibus*) of the ambo or pulpit.

**Gradual Psalms,** or SONGS OF DEGREES. Name given by both Jews and Christians to fifteen psalms, 120 to 134, which in the R. C. Church form part of the Office of the Wednesdays in Lent.

**Graduated Income Tax.** One whose rate is greater the larger the income; *e.g.*, a tax so laid that incomes less than $1,000 pay nothing, those between $1,000 and $2,000 pay 1 per cent, those between $2,000 and $3,000 2 per cent, between $3,000 and $5,000 5 per cent, etc.

**Graduating Engine.** Machine for marking divisions on the circles of surveying or astronomical instruments. The in-



Graduating Engine.

strument was first constructed by Ramsden, afterward improved by Troughton, and more recently by Simms. See DIVIDING ENGINE.

**Grady,** HENRY WOODFEN, 1851–1889. Ed. Atlanta (Ga.) *Constitution* from 1880; noted as an orator.

**Graeæ.** Sisters of the Gorgons; possessors of a single eye and tooth among the three. These were stolen by Perseus, to compel their service.

**Græcia Magna.** Greek cities and their territories in s. Italy. Strabo includes also Sicily.

**Graevius,** or GRAEFF, JOHANN GEORG, 1632–1703. German classical scholar; prof. Utrecht from 1661; ed. Cicero and other classics. *Thesaurus Antiquitatum et Historiarum Italiæ*, 12 vols., 1703.

**Graf,** ARTURO, b. 1848 in Athens. Prof. Turin 1876; poet and critic.

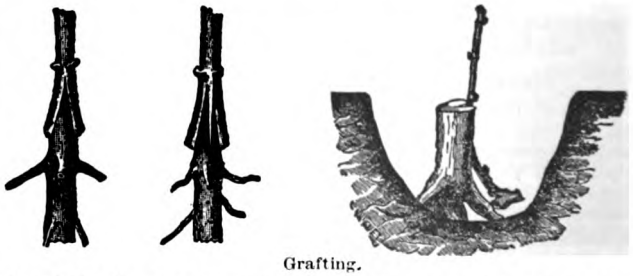
**Graf,** KARL HEINRICH, d. 1869. Prof. Leipzig; O. T. critic.

**Graff,** ANTON, 1736–1813. Court painter at Dresden. In portraiture he ranks next to Angelica Kauffmann and Raphael Mengs.

**Graffiti.** Rude inscriptions and drawings found in the Catacombs, in Pompeii, and other Roman ruins.

**Grafly,** CHARLES. American sculptor. His bronze bust of Daedalus was one of the finest exhibits at the Columbian Exposition, Chicago.

**Grafting.** Process of removing a young branch from a plant and inserting it on another, by which it may be sustained; applicable only in plants of genetic affinity. It is em-



Grafting.

ployed for the purposes of perpetuating a variety, to increase the ease and speed of multiplication and to produce some radical change in the character of the cion.

**Grafton,** AUGUSTUS HENRY FITZROY, DUKE OF, 1735–1811. Sec. of State 1765–6; Premier 1767–70; Lord Privy Seal 1771–75 and 1782–83; attacked by Junius.

**Graham,** CHARLES KINNAIRD; U.S.N., 1824–1889. Engineer; surveyor of New York 1878–83; naval officer 1883–85.

**Graham,** GEORGE REX, 1813–1894. Founder (1841) and publisher of *Graham's Magazine*, long the chief American monthly.

**Graham,** JOHN, OF CLAVERHOUSE, ab. 1643–1689. Scottish soldier, sent to harry the Covenanters, whom he met in the field at Drumclog and Bothwell Bridge, June 1 and 22, 1679; made Viscount Dundee Nov. 1688 by James II., to whom his cruelties were congenial; killed in his victory at Killiecrankie, July 27, 1689; a picturesque but terrible figure in Scottish legend, poetry, and romance.

**Graham,** THOMAS, F.R.S., 1805–1869. Prof. of Chemistry, at Glasgow, 1830–37, and Univ. Coll., London, 1837–55; Master of the Mint 1855. His *Elements of Chemistry*, 1837, was tr. into German.

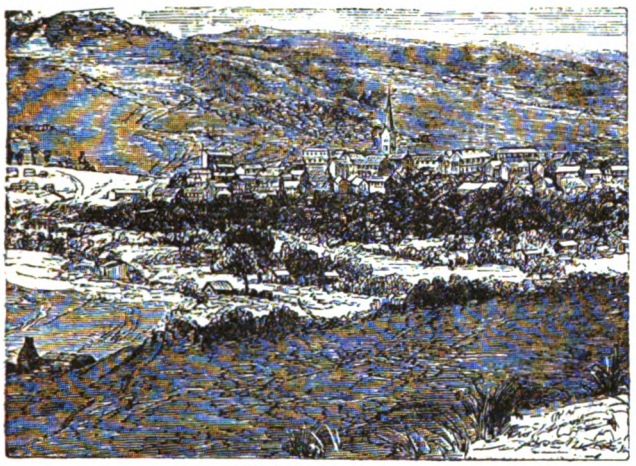
**Graham,** WILLIAM ALEXANDER, 1804–1875. U. S. Senator 1840–43; Gov. of N. C. 1845–49; Sec. Navy 1850–52; Whig candidate for Vice-Pres. 1852.—His father, JOSEPH, 1759–1836, was a Revolutionary officer, and Major-gen. 1814.

**Grahame.** JAMES, 1765–1811. Scottish poet. *The Sabbath*, 1804; *Birds of Scotland*, 1806; *British Georgies*, 1809.

**Grahamite.** Fossil asphalt in W. Va., of some value as yielding oil.

**Graham's Dike.** See ANTONINE, WALL OF.

**Grahamstown.** Chief political center e. of Cape Town, S. Africa. ab. 100 m. n.e. of Port Elizabeth. It is the residence



Grahamstown.

of the administrative, judicial and religious authorities of the eastern districts, and a health resort. Pop., 1891, 10,436.

**Grail,** HOLY. See GRAAL.

**Grain.** Usually, cereals, exclusive of Indian corn and including buckwheat; though in market reports corn is included. In some portions of the country another division is made, viz., corn and small grain; *i.e.*, wheat, oats, and barley.

**Grain.** Unit of weight in Great Britain and the U. S. In 1266 the law required 32 grains of wheat to weigh a pennyweight, but this was changed to 24 grains 1521. There are 5,760 grains in the apothecary's and troy pound, 7,000 in the avoirdupois.

**Grain Insects.** For insects that attack growing grain, see CHINCH-BUG and PLANT-LICE. Stored grain especially, if damp and heated in the bin, may become infested by a beetle (*Sylvanus surinamensis*). It may be treated cautiously with fumes of bisulphide of carbon.

**Grain Worm.** See TETRAMERA.

**Grallæ** (CHARADROMORPHÆ). Order of Birds, including the greater portion of the *Grallatores*, such as Snipe, Plovers, Bustards, and Rails. They fall into two sections, LIMICOLÆ and PALUDICOLÆ (q.v.).

**Grallarii.** Wading legs of birds, with long metatarsus.

**Grallatores** (GRALLÆ, WADING BIRDS). Order of Birds having long legs with more or less naked tibia, long neck and beak. The form of the beak varies with the nature of the food, whether worms, seeds, frogs, fish, or vermin. They live in marshy places and shallows; most are migratory. The following families are examples: *Charadriidæ* (Plovers), *Scolopacidæ* (Snipe), *Herodii* (Storks), *Rallidæ* (Rails), and *Alectoridæ* (Bustards). These are grouped into two divisions, the *Herodii* and *Grallæ* (restricted).

**Gram.** Force equal to the weight of a gram mass. See FORCE.

**Gram.** See GRAMME.

**Gram,** HANS, 1685–1748. Danish historical writer and editor.

**Gram Centimeter.** Metric gravitation unit of work. It is equal to the work necessary to raise the mass of one gram vertically against gravity through one centimeter, or 980 ergs.

**Gram Equivalent.** Number of grams of a metal which will chemically replace one gram of hydrogen, or of a salt-radical which will combine with one gram of hydrogen. In comparing HCl with AgCl, we find Ag(=108) to be equivalent to H(=1), so the gram equivalent of silver is 108 grams. Again from HCl the gram-equivalent of chlorine is evidently 35.5 grams. The gram-equivalent of a salt or acid is that quantity which contains one gram-equivalent of the halogen or salt-radical.

**Gramineæ.** Natural family of flowering plants, of the class *Angiospermæ*, sub-class *Monocotyledons*, comprising ab. 315 genera and ab. 4,000 species, distributed plentifully throughout all parts of the earth; commonly called the Grass family.

**Graminology.** Study of grasses; agrostology.

**Grammar.** See PHILOLOGY.

**Gramme,** or GRAM. Metric unit of weight equal to 15.432+ troy grains.

**Gramont,** PHILIBERT DE, 1621–1707. French officer of loose character, noted for his *Memoirs*, pub. 1713.

**Gramophone.** Instrument invented by Berliner for recording and reproducing speech. The record is made by a stylus on a prepared glass plate, the motion of the stylus being in a plane parallel to that of the plate. From this a casting is taken in plaster or wax according to one of the various methods known in the art of photo engraving. If now a stylus be made to follow the groove in this phonautogram, sound waves of the same character as the original ones may be reproduced.

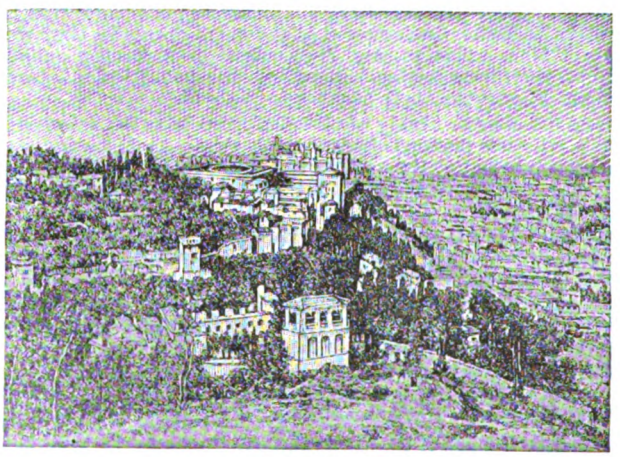
**Grampians.** 1. Mountains of Scotland, so named 1527: height 2,000 to 4,400 ft. 2. Range in Australia; greatest height 5,600 ft.

**Grampus.** See DELPHINIDÆ (*Cetacea*).

**Gran.** Old town of Hungary, on the Danube, 25 m. n.w. of Pesth; taken by Tartars 1241; scene of an Austrian defeat Feb. 27, 1849.

**Granada.** Anciently, part of the Roman province of Bætica; conquered with the rest of Spain by Moors in 8th century; dependent on Cordova till 1236, then a kingdom, soon subject to Castile. A war of 11 years with Ferdinand and Isabella ended in entire conquest and annexation to Spain.

**Granada.** City of Spain, on the Jenil at the mouth of the Darro. It contains the Alhambra and other Moorish remains.



Granada.

The university, founded 1531, has ab. 1,000 students. Pop. (some 400,000 at the Spanish conquest, 1492), 1887, 73,000.

**Granadilla.** Several species of *Passiflora* (Passion-flowers), bearing large, edible fruits; found in W. Indies.

**Granby,** JOHN MANNERS, MARQUIS OF, 1721–1770. English general, prominent in the German wars; attacked by Junius.

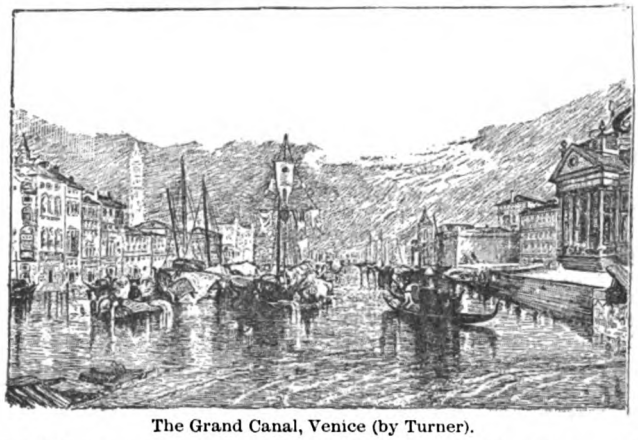
**Gran Chaco.** Flat region of S. America, w. of the Paraguay and n. of the Salado, extending n. to ab. 18° S. lat.; area ab. 325,000 sq. m.; has few inhabitants except Indians; large portions are subject to inundation. Some white settlements have been made on the s. and e. borders.

**Grand,** SARAH (MRS. C. R. MCFALL), b. ab. 1850. English novelist. *Ideala*, 1891; *The Heavenly Twins*, 1893, occasioned much comment.

**Grand Alliance.** Between the Emperor and the States-General; signed at Vienna May 12, 1689; joined later by England, Spain, and Savoy. It aimed to prevent the union of French and Spanish monarchies.

**Grand Army of the Republic.** Association of veterans of the Civil War. The first Post was chartered at Decatur, Ill., April 6, 1866. There are now (1895) ab. 7,500 Posts with an aggregate membership of 391,670. A Department (State) and a National encampment are held each year. May 30 is observed as "Memorial Day" by addresses and the decoration of the graves of comrades. Their motto is "Fraternity, Charity, and Loyalty."

**Grand Canal,** THE. Serpentine waterway 2½ m. long separating the two main islands on which Venice is built. It is



The Grand Canal, Venice (by Turner).

lined by magnificent palaces, and was bridged by the superb Rialto 1591. Two iron bridges have been added during the present century.

**Grand Contumier.** 1. Collection of French law projected by Charles VII., completed 1609. 2. Collection of Norman law compiled under Henry III. of England ab. 1230.

**Grande Culture.** Cultivation on a large scale by employing labor, as opposed to cultivation of small farms by peasant proprietors or tenants. The relative advantages of the two systems are an old subject of discussion and difference of opinion.

**Grandees.** Higher nobility of Spain, dating from the 13th century, whose privileges were almost regal. They had the right to keep the head covered in the royal presence, they were exempt from taxation, and they might join foreign enemies against their king without incurring the penalties of treason. Charles V. reduced their number to sixteen.

**Grand Jury.** Body of citizens, from 12 to 24, selected to decide whether persons charged with crime shall be indicted. They hear in secret the evidence in support of the charges, but not that in favor of the accused: their decision does not fix the prisoner's guilt.

**Grand Manan.** Island in the Bay of Fundy 17 m. long by 7 m. broad, fertile, with good harbors and fisheries, and a favorite summer resort. Pop. ab. 3,000.

**Grand Pensionary.** Chief state functionary in Holland during the 16th century; the office was held for five years, but the incumbent was usually re-elected.

**Grand Rapids.** Capital of Kent co., Mich., on Grand River, 40 m. from its mouth. It has six railroads, and is noted for extensive manufactures of furniture. Pop., 1890, 60,278.

**Grand River.** Eastern and smaller of the two head branches of the Colorado. It heads in Middle Park, Col., and flows s.w., crossing many mountain and plateau uplifts nearly at right angles; its course is a succession of gorges and open valleys. By the uplift of the Uncompahgre plateau, in w. Col., it was turned from its direct course and forced to make a detour. Drainage area 29,268 sq. m.

**Grand Rounds.** Visitation of the chain of sentinels about midnight by a general or field officer, or by the commandant, to ascertain whether they are alert and to learn what passes in the outworks.

**Grandval,** MARIE FÉLICIE CLEMENCE DE REISET, VICOMTESSE DE, b. 1830. French composer of operas and other music.

**Grandville,** JEAN IGNACE ISIDORE GÉRARD, 1803–1847. French caricaturist and illustrator.

**Granet,** FRANÇOIS MARIUS, 1775–1849. French painter, chiefly of interiors and architectural subjects. Custodian of the Louvre 1826, Member of the Institute 1830. He spent most of his life at Rome and left his fortune and pictures to Aix, his native city, to form a museum.

St. Louis delivering French prisoners at Damietta (Amiens Museum), by Granet.

**Grange.** See GRANGERS.

**Granger,** GORDON, U.S.A., 1821–1876. Major-gen. U. S. Vols. 1862–66; prominent in the Tenn. battles.

**Granger,** JAMES, 1716–1776. English vicar, whose *Biographical History*, 1769, started or stimulated the practice of extending books by inserting engravings, or "grangerizing."

**Grangers,** or PATRONS OF HUSBANDRY. Secret order of American farmers, founded 1867 by O. H. Kelly. They have State and local granges, and are combined into a national society. They have influenced legislation in several States, and done something in initiating co-operative movements and other reforms. In 1894 there were 41 State and 26,954 subordinate granges.

**Granicus.** River of Mysia, Asia Minor, flowing into Sea of Marmora; noted for Alexander's victory over the Persians 334 B.C., and that of Lucullus over Mithridates 73 B.C.

**Granite.** One of the most common massive granular crystalline rocks, varying considerably in coarseness of grain and in color, but consisting essentially of feldspar, quartz, and mica, in grains distinctly visible to the naked eye. Some granite is of igneous origin and some metamorphic. Its ultimate compressive strength varies from 5,000 to 15,000 lbs. per sq. inch. The term granite as used by the mason includes many kinds of rock which to the mineralogist are known by other names.

**Granitzers.** Military colonies established on the Turkish frontier by Prince Eugene.

**Gran Sasso.** Spur of the Apennines, Italy, in which the Abruzzi culminate. The highest peak is Monte Corno, 9,580 ft.

**Granson.** Old town of Switzerland, on Lake Neuchâtel; scene of a Swiss victory over Charles the Bold, March 3, 1476, against greatly superior numbers.

**Grant.** In early common law, transfer of property which was not susceptible of delivery; in its broadest sense, transfer of property or concession of rights.

**Grant,** SIR ALEXANDER, LL.D., D.C.L., 1826–1884. Prof. at Madras; director of instruction in Bombay; principal Univ. Edinburgh 1868, and its historian 1884; ed. Aristotle and Xenophon.

**Grant,** MRS. ANNE (MACVICAR), of Laggan, 1755–1838. Scottish author, m. 1779, widowed 1801, pensioned 1825. *Letters from the Mountains*, 1806; *Memoirs of an American Lady* (Mrs. Philip Schuyler), 1808; *Superstitions of the Highlanders*, 1811; and two vols. of verse.

**Grant,** CHARLES, LORD GLENELG, 1779–1866. M. P. 1811; Sec. for Ireland 1819–21; Sec. for the Colonies 1834–39; Baron 1835.

**Grant,** SIR FRANCIS, R.A., D.C.L., 1803–1878. Scottish portrait painter, knighted 1866.

**Grant,** JAMES, 1743–1835. Scottish essayist. *Origin of Society*, 1785; *Origin and Descent of the Gael*, 1814.—His grandson, SIR JAMES ALEXANDER, is a prominent physician in Montreal, knighted 1887. He moved the first Canadian Pacific R. R. bill in the Dominion Parliament.

**Grant,** JAMES, 1822–1887. Scottish novelist. *Romance of War*, 1846; *Bothwell*, 1851; *Old and New Edinburgh*, 3 vols., 1880–83.

**Grant,** JAMES AUGUSTUS, LL.D., F.R.S., 1827–1892. Scottish soldier in India from 1845; wounded at Lucknow; Speke's associate in discovering the source of the Nile 1863; in the Abyssinian expedition 1868; author of several books on Africa.

**Grant,** SIR JAMES HOPE, 1808–1875. Brother of Sir Francis; Major-gen. 1858; Lieut.-gen. 1861; General 1872. His services were in India and China. *Incidents of the Sepoy War*, 1883.

**Grant,** SIR PATRICK, 1804–1895. Commander-in-chief in India 1857: Gov. of Malta 1867–72; General 1870; Gov. of Chelsea Hospital from 1874; Field-marshal.

**Grant,** SIR ROBERT, 1785–1838. Brother of Charles; M. P. 1826, Privy Councilor 1831, Gov. of Bombay 1834; author of a few fine hymns, 1806–15, collected 1839.

**Grant,** ROBERT, 1814–1892. Prof. and director of the Observatory Univ. Glasgow from 1859. *Hist. Physical Astronomy.*

**Grant,** ROBERT, b. 1852. American novelist, satirist, and essayist. *Little Tin Gods on Wheels*, 1879; *Confessions of a Frivolous Girl*, 1880; *Lambs*, 1882; *An Average Man*, 1883; *Knave of Hearts*, 1885; *A Romantic Young Lady*, 1886; *Face to Face*, 1886; *A Married Man*, 1892; *Opinions of a Philosopher*, 1893.

**Grant,** ULYSSES SIMPSON, 1822–1885. Lieutenant-gen. and 18th Pres. U. S. He graduated at West Point in 1843 and served in the Mexican War. He was put in command of 25th Ill. Vols. 1861, and soon made Brig.-gen. His success in gaining control of the Tennessee River and forcing back the Confederate forces awakened popular confidence in him, but the doubt of his ability on the part of his superiors, with a defeat at Pittsburg Landing, April 1862, kept him in a subordinate position until the remarkable strategic ability and fighting power displayed in the capture of Vicksburg, July 4, 1863,

Ulyssus S. Grant.

brought him to the foremost place, and he was appointed Commander-in-chief. He assumed command in Va. 1864, and by the following spring reduced the army of Lee and brought the war to an end. His election to the Presidency in 1868 was inevitable. The Republican party relied on him to carry out its measures of reconstruction. He was re-elected for a second term 1873–77, and received a large vote for the nomination for a third term. He made a tour around the world 1877–79, and was everywhere received with enthusiasm. His *Personal Memoirs*, 1885, largely written during his fatal illness, had an enormous circulation.

**Granular Lids.** Chronic, moderately contagious disease of the eyelids, which often results from neglected conjunctivitis. Granular or sago-like bodies form on the interior of the lids, which may contract and become distorted. The cornea may ulcerate or be covered with a vascular membrane. Powerful astringents, as copper sulphate, and cutting off of the granulations, are appropriate treatment.

**Granulations.** 1. Rounded, reddish vascular bodies found in open wounds; by their union the wound is filled up. When over abundant they constitute proud flesh. 2. Any granular bodies.

**Granules.** In Biology, minute bodies floating in the cell sap or protoplasm, which are of very different substances; most are deuteroplasm. Some have characteristics belonging to gemmules, and it is probable that the nucleus, more especially the nucleolus, is to be considered either as an aggregation of granules, or as a special and large granule.

**Granulite.** Schistose rock consisting essentially of orthoclase and quartz, and frequently containing disseminated garnets.

**Granulose.** Substance dissolved from starch grains by saliva or other reagents. The insoluble portion is called starch-cellulose.

**Granvelle,** ANTOINE PERRENOT, CARDINAL DE, 1517–1586. State Councilor of Charles V.; sent to Council of Trent 1545; Chancellor of the Empire 1550. He arranged marriage between Philip II. and Mary of England 1553, negotiated the treaty of Passau 1552, and of Cateau Cambrésis 1559; Abp. of Malines 1560, Cardinal 1561; Prime Minister to Margaret of Parma 1559–64, but forced to leave office by the hostility of nobles and people; Spanish Envoy at Rome 1570; Viceroy of Naples 1570–75; Abp. of Besançon 1584; a cunning diplomatist and able tool of tyranny.

**Granville,** GEORGE, VISCOUNT LANSDOWNE, 1667–1735. Sec. of War 1710; imprisoned as a Jacobite 1714–15; in France 1722–32; dramatist and poet. *Works*, 1732.

**Granville,** GEORGE LEVESON-GOWER, D.C.L., F.R.S., EARL, 1815–1891. M. P. 1836, Earl 1846; member of every Liberal cabinet from 1851; Colonial Sec. 1868–70 and 1886; Foreign Sec. 1870–74 and 1880–85.

**Granville,** JOHN CARTERET, EARL, 1690–1763. Baron 1711; Earl 1744; Envoy to Sweden 1718–19; Sec. of State 1721 and 1742; Lord-lieut. of Ireland 1724–26 and 1729–30; leader of the opposition to Walpole 1730–42.

**Grape.** Well-known vines of the genus *Vitis*, natural family *Vitaceæ*, of wide geographical distribution.

**Grape Cure.** Method of treatment of various chronic affections, which consists in the eating of enormous amounts of freshly picked grapes. Usually a light diet is allowed, but often nothing but grapes are permitted. It is of benefit on account of the laxative and diuretic properties of the fruit, but probably the surroundings of the localities (France, Germany, etc.), where this method is followed, are the most potent elements.

Grape (*Vitis vinifera*).

**Grape-Hyacinth.** Blue-flowered, bulbous plants of the genus *Muscari* in the Lily family, blooming in early spring; natives of Europe, introduced by cultivation into N. America.

**Grape Shot.** Group of nine iron balls, arranged in tiers of three, combined by means of a central bolt, a top and a bottom plate, and two intermediate iron rings; now becoming obsolete from the disappearance of smooth-bore guns. They were fired against troops at close range, and at the masts and rigging of vessels. When first introduced they were quilted into canvas bags and named from their appearance.

Grape Shot.

**Grape Sugar.** See DEXTROSE.

**Graphic Arts.** Various methods of painting, drawing, and engraving. See AQUATINT, ENGRAVING (STEEL, STIPPLE, and WOOD), ETCHING, FRESCO, LITHOGRAPHY, MEZZOTINT, PAINTING, PASTEL, PHOTOGRAVURE, TEMPERA, and WATER-COLOR.

**Graphic Formula.** See FORMULA.

**Graphic Statics.** Method of finding stresses in roof and bridge trusses by drawing and measuring lines instead of computing. The principle of the parallelogram of forces is the starting point of the science; the polygon of force and the equilibrium polygon are other useful principles. It was first introduced in 1866 by Culmann, and now forms an essential part of every book on the theory of roofs and bridges.

**Graphic Tellurium.** $(Ag,Au)Te_2$. Sylvanite; rich gold and silver telluride, found sparingly at a few localities.

**Graphite.** Mineral form of carbon, of vegetable origin, black in color and metallic in luster. It is soft enough to mark paper, and has a specific gravity of ab. 2. It is often met in the older geological formations, either disseminated through rock or occurring in independent veins, but the number of mines actually worked is small. Large quantities are obtained from Ceylon. The best-known deposit in the U. S. is at Ticonderoga, N. Y. Graphite has a large and rapidly increasing use in the arts, chiefly for refractory crucibles, stove-polish, pencils, foundry-facings, and as a lubricant. The popular names, plumbago and black lead, have no good justification.

**Graphitic Acid.** $C_{11}H_4O_5$ or $C_{11}H_4O_6$? Yellow, microscopic leaflets, soluble in water and alcohol; formed on oxidizing Ceylon graphite with potassium chlorate and nitric acid, also by the use of a positive electrode of pure graphite, in the electrolysis of dilute sulphuric or nitric acid.

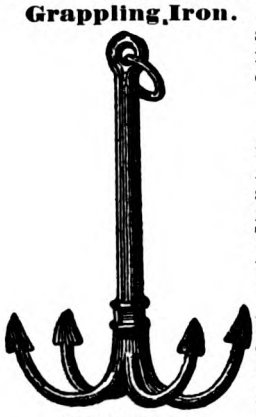
**Graphophone.** Inversion of "phonograph"; first introduced by C. A. Bell. In principle the graphophone is entirely similar to the phonograph, from which it differs only in the details of its construction.

**Graphotype.** Process for making a block from which could be obtained relief plates suitable for type press-printing; invented by E. B. Larchar 1854, and perfected by D. C. Hitchcock. Finely powdered chalk was submitted to great hydraulic pressure, and forced into a solid white block, which, having been pressed with a steel plate on the top, came from the machine with a perfectly smooth, shiny surface, on which the drawing was made with liquid silex, colored with india ink; this, when dry, hardened the drawn lines to the consistency of stone. The plate was then put under a revolving brush, and the chalk, unacted upon by the drawing medium, was slowly brushed away, leaving the lines of the design in high relief. The whole block was then immersed in a silicate bath, which so hardened the entire mass that a plaster of Paris mold could be taken from it, and a stereotype plate made from the mold in the ordinary way. This plate, being of type metal, could be worked on with the graver, and brought to a considerable degree of refinement. A company was formed to work the invention, but lived only a few months.

Grapnel.

**Grapnel.** Implement for clutching objects for the purpose of raising them. This term is specially applied to devices for withdrawing pipes, drills, reamers, etc., from artesian, oil, and other wells, which are drilled, bored, or driven. The form shown is used for recovering well tubes from bored wells.

**Grappling Iron.** Instrument with four or six hooks like anchor flukes attached. Used for seizing and holding fast small boats or other objects.

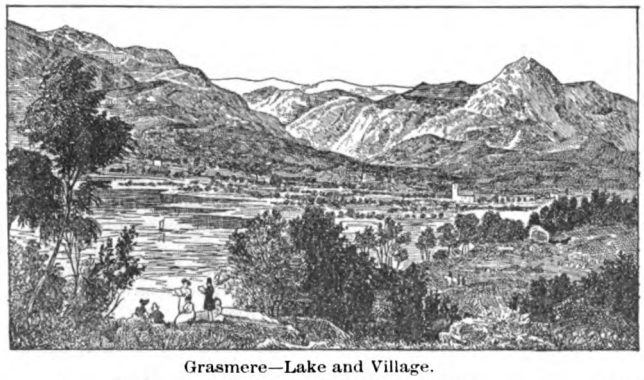

Grappling Iron.

**Grapsoidea.** See CRABS.

**Graptolites.** Delicate plume-like fossils characteristic of Silurian and Ardovician strata. Each branchlet or stem was probably margined with little flower-like animals resembling polyps. They are generally placed with the *Hydrozoa*, but by some with the *Polyzoa*. See GRAPTOLITIDÆ.

**Graptolitidæ** (GRAPTOLITOIDEA or RHABDOPHORA). Fossil *Hydrozoa* with compound hydrosoma, sometimes branched, bearing numerous polypites, protected by hydrothecæ and united by cœnosarc. All is inclosed in a tubular polypary, sometimes strengthened by a solid axis. They were generally free-swimming. They are delicate forms, allied to Sertularians. The polyps may be on one side or both sides of the stem. Traces of a pneumatophore have been found.

**Grasmere.** Village and lake in Cumberland, Eng., where Wordsworth settled 1799. Its churchyard contains his grave


Grasmere—Lake and Village.

and that of Hartley Coleridge. The lake has an area of ab. 400 acres. Pop., 1891, 684.

**Grass.** Surface at mouth of a mine.

**Grass,** BERMUDA. *Capriola dactylon.* Spreading, weed-like grass, native of Europe, abundantly introduced into the warmer parts of America.

**Grass,** BLUE-EYED. *Sisyrinchium angustifolium.* Blue-flowered plant of natural family *Irideæ*, native of N. America.

**Grass,** BUFFALO. *Bulbilis dactyloides.* Low diœcious grass of the plains of central N. America, very valuable for grazing.

**Grass,** BUR. *Cenchrus tribuloides.* Spiny-flowered grass, growing abundantly in sandy soil in e. N. America; also called Hedgehog Grass.

**Grass,** CAT'S TAIL. See TIMOTHY GRASS.

**Grass,** EGYPTIAN. *Eleusine ægyptiaca.* Weedy grass of the Old World, introduced into the s. U. S.

**Grass,** FLY-CATCH. Marsh grass *Homalocenchrus lenticularis*, native of the s. U. S. The flowers are said to catch insects.

**Grass,** FOX-TAIL. Grasses of the genus *Ixophorus*, mainly natives of the Old World, introduced as weeds into N. America.

**Grass,** GAMA. *Tripsacum dactyloides.* Tall marsh grass of e. N. America.

**Grass,** HEDGEHOG. See GRASS, BUR.

**Grass,** HOLY. *Savastana odorata.* Sweet-smelling grass growing in marshy places in Europe and N. America; known also as Seneca Grass and Vanilla Grass.

**Grass,** INDIAN. *Chrysopogon nutans.* Large grass, native of e. America; known also as Wood Grass.

**Grass,** ORCHARD. *Dactylis glomerata.* Native of Europe, introduced into fields and meadows in N. America.

**Grass,** YELLOW-EYED. Erect, slender, yellow-flowered herbs, of the genus *Xyris*, natural family *Xyridaceæ*, natives of swampy places in N. and S. America.

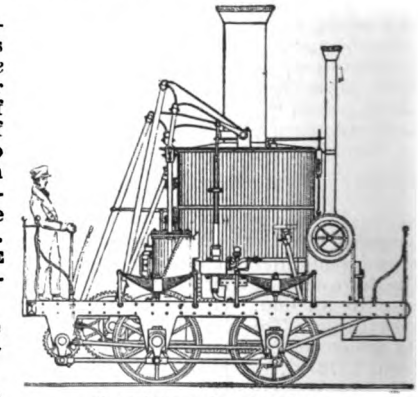
**Grass Cloth.** Fabric made from the fibers of the *Boehmeria nivea.* It is extensively used in China, being woven into narrow strips and into handkerchiefs.

**Grasse.** Fashionable health resort 9 m. n.w. of Cannes, s. France. It has Roman remains and manufactories of silk and perfumery. Pop., 1891, 15,234.

**Grasse,** FRANÇOIS JOSEPH PAUL, COUNT DE, 1723–1788. French naval officer who served in the American Revolution, assisting Washington and Lafayette in the capture of Cornwallis.

**Grässe,** JOHANN GEORG THEODOR, 1814–1885. Saxon antiquarian and critic. *Literaturgeschichte*, 8 vols., 1844–59; *Tresor de livres rares et precieux*, 8 vols., 1858–68; *Porcelaines et Poteries*, 1864.

**Grasses.** Agriculturally, those members of the order *Graminæ* that are used wholly for forage or pasture. Of the large number of grasses indigenous to the U. S. few have been brought under cultivation. These are here treated of separately. See TIMOTHY, BLUE GRASS, RED TOP, ORCHARD GRASS.


Grasshopper Locomotive.

**Grasshopper.** See ACRIDIIDÆ and LOCUSTIDÆ.

**Grasshopper Locomotive.** One with vertical boiler; invented by Ross Winans 1836, and used on the Washington and Baltimore Railroad.

**Grassman,** HERMANN GÜNTHER, 1809–1877. Prof. of Mathematics at Stettin 1852; with W. R. Hamilton, originator of a new branch of higher analysis; contributor to Crelle's *Journal. Ausdehlungslehre*, 1844–62.

**Grass of Parnassus.** White-flowered marsh herbs of the genus *Parnassia*, natural family *Saxifragaceæ*, natives of the cooler portions of the n. hemisphere.

**Grass of the Andes.** Erroneous name for *Arrhenatherum avenaceum*, a beautiful European grass, introduced into N. America.

Grass of Parnassus (*Parnassia palustris*).

**Grass-Wrack.** See EEL GRASS.

**Grate Bars for Boilers.** These should give adequate support for the fuel, but have sufficient open spaces for air passage. In large fuels, this proportion should be from 25 to 50 per cent. For small coal, where an excess would fall through, the lack has to be made good by greater intensity of draft. They should also be of a design which will not warp with heat, and deep enough to be kept cool by the inrushing draft of cool air. Usually they are of cast iron, though one form of wrought bar is approved, and water grates of wrought iron pipe are extensively used. Shaking grates give the firemen less exhausting work, and require less frequent and prolonged opening of the fire door. Traveling grates are self-cleansing, and can easily be made self-feeding, doing away entirely with the opening of a fire-door and its injury to the shell and the heat of the fire.

**Gratianus,** 359-383. Son of Valentinian I.; Emperor 375; colleague of Valens till 378, and then of Theodosius.

**Gratianus,** FRANCISCUS, ab. 1100. Bp. of Chiusi in Italy; collector of the canon law. His *Decretum*, including the *False Decretals*, had much influence, and was revised 1580.

**Gratitude.** Return to a benefactor of the good due to him on account of the good he has done to us.

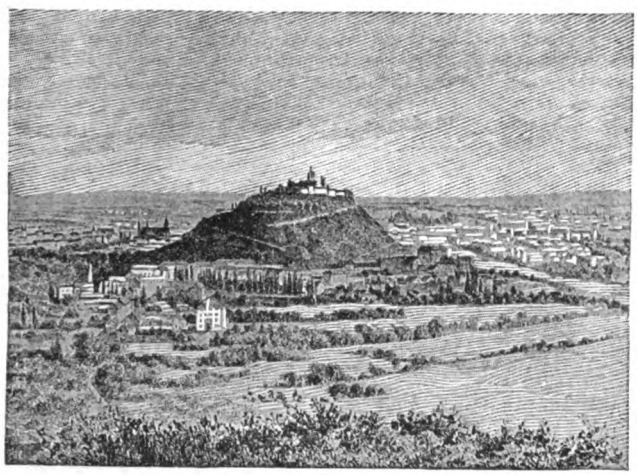
**Gratry,** AUGUSTE JOSEPH ALPHONSE, 1805-1872. French priest, noted for eloquence; prof. in the Sorbonne 1863, Academician 1867; opponent of Papal infallibility, and a prolific writer. *Month of Mary*, tr. 1860; *Moral and Law of History*, 1868.

**Grattan,** HENRY, 1746-1820. Irish orator, M. P. in Dublin 1775, and London 1805; famous for eloquence, patriotism, and purity. *Speeches*, 4 vols., 1822.

**Grattan,** THOMAS COLLEY, 1796-1864. Irish novelist and descriptive writer. *Highways and Byways*, 8 vols., 1823-27; *Heiress of Bruges*, 1830; *Hist. Netherlands*, 1830.

**Grattius Faliscus,** 1st century B.C. Roman poet. His *Cynegetica*, on hunting, was in part recovered ab. 1500, pub. 1534, and tr. 1654.

**Gratz.** Capital of Styria, Austria, on the Muir. It has a large trade and manufactures. Its university has over



Gratz.

1,000 students. It was attacked by Turks 1532, occupied by the French 1797 and 1809. Pop., 1890, 113,540.

**Grau,** RUDOLF FRIEDRICH, D.D., b. 1835. Prof. Konigsberg 1865. *Goal of the Human Race*, 1875, tr. 1892.

**Graul,** KARL, D.D., 1814-64. Director Missionary Soc. at Dresden and Leipzig 1844-60. He wrote much on Tamil literature, and 5 vols. of East Indian travel, 1854-56.

**Graun,** KARL HEINRICH, 1701-1759. Chapelmaster of Frederick II.; organizer of the Royal Opera in Berlin; voluminous composer of operas. An oratorio of his, *Der Tod Jesu*, for whose annual performance in Berlin a foundation exists, alone retains life.

**Gravagrada.** See LORICATA (*Edentata*).

**Gravel.** Pebbles of stone less than one inch in diameter and coarser than sand; used for making mortar and concrete, and also as a top dressing for roads. Angular gravel is usually better than round. Gravelly soils are finely divided, easily worked, and have many of the characteristics of sandy soils, but are usually more fertile and not quite so quickly affected by lack of water.

**Gravel.** Material forming a stone in the bladder, especially when in fragments; also the condition in which this is found. See CALCULUS.

**Gravelines.** Town of n. France; scene of a victory of the Spaniards over the French July 13, 1558, followed by a treaty ending the Italian wars. Pop., 1891, 5,952.

**Gravel Mine.** Deposit of auriferous gravel in Cal., worked by the hydraulic process for the gold it contains.

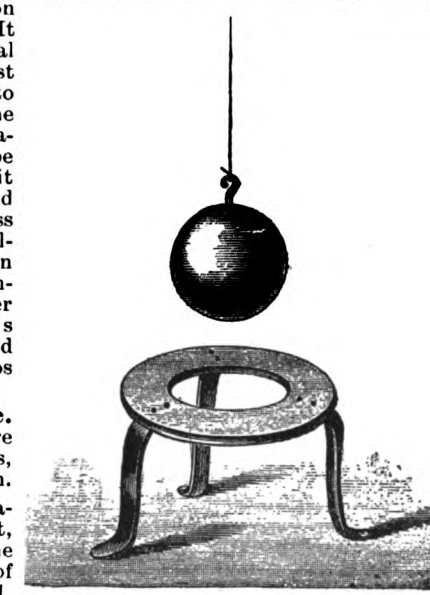
**Gravelotte** (or REZONVILLE), BATTLE OF. Aug. 18, 1870, in Lorraine. It resulted, after 12 hours' desperate fighting, in the defeat of the French under Bazaine by the 1st and 2d German armies commanded by the King. German loss 20,000; French, 13,000 and many prisoners.

**Gravel Root.** See JOE-PYE WEED.

**Graveolent.** Plants of a strong and disagreeable odor.

**Graves,** ROBERT JAMES, M.D., F.R.S., 1797-1853. Prof. Dublin 1827. *Clinical Medicine*, 1843; *Studies in Physiology*, 1863.

**Gravesande's Ring.** Apparatus devised to demonstrate the volume expansion of solids by heat. It consists of a metal ring which will just allow a metal ball to pass through it at the ordinary temperature. If the ball be heated over a spirit lamp, it expands and will no longer pass through. If it be allowed to rest upon the ring forsome minminutes, the latter gradually becomes heated, expands, and the ball then drops through.



Gravesande's Ring.

**Graves' Disease.** Exophthalmic goitre described by Graves, an English physician.

**Gravesend.** Watering-place in Kent, near the mouth of the Thames, 24 m. e. of London. Pop., 1891, 24,067.

**Graveyards.** In thickly populated districts these may be very fertile sources of ill-health and diseases. The products of decomposition, especially the ptomanies and bacteria, are apt to percolate into the water supply.

**Gravicymbalum.** See PIANOFORTE.

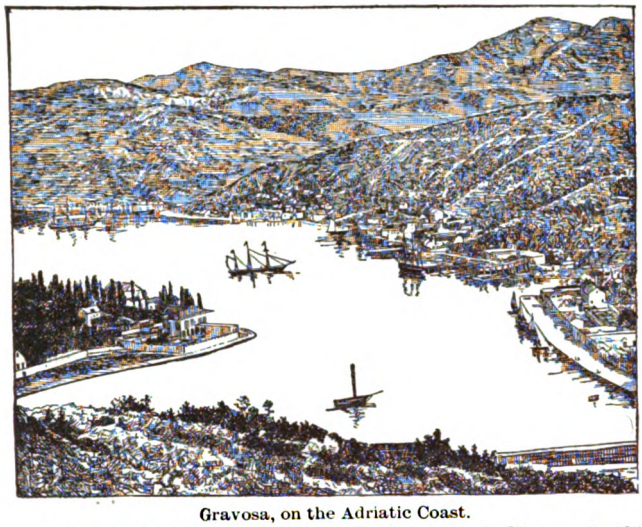
**Gravigrada.** See MEGATHERIUM.

**Gravimetric Density.** Density of grained powder, including its interstitial volumes; for loosely piled gunpowder of irregular granulation it is ab. 0.9 that of water.

**Gravity,** or GRAVITATION. Mutual attraction of matter for matter. The universal law of gravitation first given by Newton is essentially as follows: every body in the universe attracts every other body with a force which is proportional to the product of their two masses and inversely to the square of the distance between their centers of mass. If one of the bodies be the earth, the gravity of the other body is its weight, and at the surface is equal to g poundals per pound of mass. On account of the spheroidal shape of the earth, weight increases with the latitude, but the centrifugal tendency decreases as the latitude increases. Clairaut has deduced a formula from which the value of gravity can be calculated in terms of its value at the equator and the latitude of the place. If G be the weight of unit mass at the equator and g that at latitude $\lambda$, then $g=G(1+0.005133 \sin^2\lambda)$. ($G=32.088$ poundals).

**Gravosa.** Port of Ragusa, Dalmatia, Austria, from which it is distant 1½ m. It has a fine harbor and ranks third in Austrian shipping trade. It is frequently visited by earthquakes.

Olives, anchovies, and the products of Herzegovina are shipped from here. Pop. ab. 1,800.



Gravosa, on the Adriatic Coast.

**Gray,** ASA, M.D., LL.D., 1810–1888. Prof. Harvard 1842. *Elements of Botany*, 1836; *Botanical Text-Book*, 1842; *Botany of Northern U. S.*, 1848–67; *Genera Floræ Americanæ Boreali-orientalis*, 1848–49; *Botanical Collections of Expedition of Com. Perry to Japan*, 1856; *Botany of U. S. Expedition under Capt. Wilkes*, 1854; *Synoptical Flora of N. America*, 1878–84; *Letters*, 1893.

**Gray,** DAVID, 1838–1861. Scottish poet of precocious talent. *The Luggie*, etc., 1862.

**Gray,** ELISHA, b. 1835. American inventor; owner of many patents relating to the telegraph and telephone.

**Gray,** GEORGE, b. 1840. U. S. Senator from Del. since 1885.

**Gray,** HENRY PETERS, 1819–1877. American painter.

**Gray,** HORACE, LL.D., b. 1829. Justice Mass. Supreme Ct. 1864; Chief-justice 1873; Associate Justice U. S. Supreme Ct. 1881. *Mass. Reports*, 16 vols., 1867–71.

**Gray,** ISAAC PUSEY, 1828–1895. Gov. of Indiana 1885–88; U. S. Minister to Mexico 1892.

**Gray,** JOHN EDWARD, F.R.S., 1800–1875. Naturalist, in British Museum 1824–74. *Indian Zoölogy*, 1830–35.

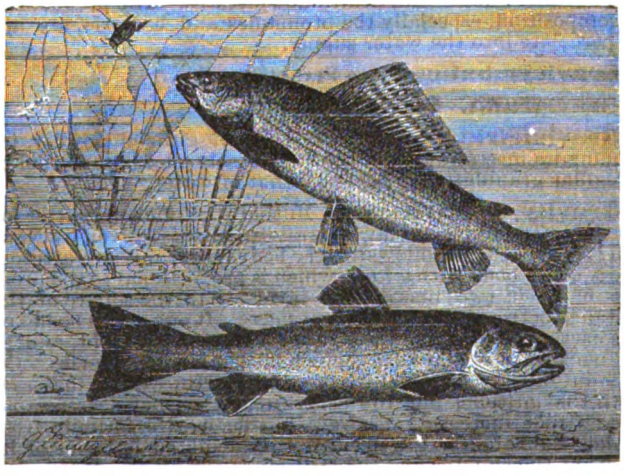
**Gray,** JOHN PERDUE, M.D., LL.D., 1825–1886. Alienist; medical supt. N. Y. Asylum at Utica from 1854; prof. Bellevue 1874–82.

**Gray,** THOMAS, 1716–1771. English lyric poet of equal ability and indolence. *Elegy in a Country Churchyard*, 1749. He wrote little, but enough for enduring fame.

**Gray Antimony.** See STIBNITE.

**Gray Copper.** See TETRAHEDRITE.

**Grayling** (*Thymallus*). Genus of *Salmonidæ*, characterized by the presence of a high dorsal fin of more than 20 rays.



Grayling:
1. Æsche (*Thymallus vulgaris*); 2. Saibling (*Salmo salvelinus*).

It is brilliantly colored, has no teeth on the tongue, and is intermediate between Whitefish and Trout. It inhabits clear, cold brooks.

**Gray's Inn.** See INNS OF COURT.

**Gray's Peak.** In the Colorado range, Col., ht. 14,466 ft.

**Grazzini,** ANTONIO FRANCESCO, called IL LASCA, 1503–1583. Italian dramatist and writer of novelle; founder of the Della Cruscan Academy 1582. *Le Cene*, Boccaccian tales.

**Grease Trap.** Trap connected with a kitchen sink, which catches and retains the grease mixed with the water, thus preventing it from entering and obstructing the drainage pipes of the house.

**Great Basin.** Area comprising 228,150 sq. m. in and adjoining Nevada, Utah, and Cal., which has no drainage to either ocean; the waters either sink into the ground or are evaporated. The surface is an alternation of broad desert valleys and narrow, abrupt mountain ranges. The elevation of the valleys ranges from below sea level up to 6,000 ft., while several peaks exceed 12,000. It is a collection of basins of various sizes, in each of which the water collects and sinks. The largest of these are the Salt Lake Basin, in the e. part, the Carson-Humboldt in the w., the Mahlheur in the n., and the Mojave in the s. The climate is arid in the extreme. Vegetation and animal life are scanty.

**Great Bear Lake.** In Canada, on the Arctic Circle, draining into Mackenzie River. Area, 7,012 sq. m.

**Great Bell of Moscow.** See KREMLIN.

**Great Bridge.** Across Elizabeth River, near Norfolk, Va. The British were repulsed here by the Virginians Dec. 9, 1775.

**Great Britain.** Largest, wealthiest, and most populous island of Europe; in the Atlantic, off w. coast of Continental Europe, separated from it by the North Sea, Strait of Dover, the English Channel. Its area is 83,826 sq. m., its extreme length 608 m. The surface is generally level or undulating in the south, hilly and even mountainous in the north. The coast is very broken, affording many excellent harbors. The island has many rivers which are navigable for long distances inland. It is divided into England, Scotland, and Wales, which with Ireland and the adjacent islands form the United Kingdom, one of the strongest of European powers, the first in wealth, manufactures, and commerce. It has an area of 120,973 sq. m. Pop., 1891, 38,104,973. An average of 315 per sq. m. The population is distributed among its principal subdivisions as follows: England, 27,483,490; Ireland, 4,704,750; Scotland, 4,025,647; Wales, 1,518,914. Its agricultural industry, never extensive, is diminishing under competition with the cheap lands and wholesale methods of America and the Colonies. Its manufactures are enormous and most varied, consisting principally of cotton, iron, and steel. Its mineral products, mainly coal and iron, are very great, the total value for 1892 being $411,753,800. The amount of coal mined was 181,786,871 tons, and of iron ore 11,312,675 tons. The exports, 1893, were $1,387,159,205, and the imports $2,025,338,450. The merchant marine consisted (1892) of 21,528 vessels with a total tonnage of 8,644,754. Its railroads had an extent in the same year of 20,325 m., and its canals 3,813 m. The United Kingdom has colonial possessions in all parts of the world, and their population added to that of the home country make this the greatest people numerically in the world. The following are the principal colonial possessions 1891:

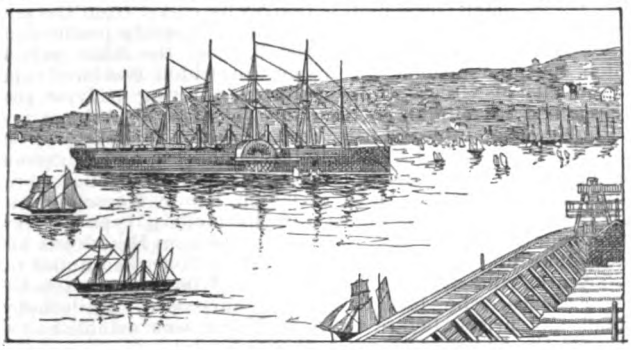
| | Area Sq. M. | Population |
|---|---|---|
| Gibraltar | 2 | 26,050 |
| Malta | 119 | 166,889 |
| Cyprus | 3,580 | 209,286 |
| British India | 964,993 | 221,172,952 |
| Native Indian States (Protectorate) | 595,167 | 66,050,479 |
| Other tracts | | 869,578 |
| Ceylon | 25,364 | 3,008,466 |
| Straits Settlements and Malacca Protectorate | 35,243 | 930,869 |
| Hong-Kong | 30 | 221,441 |
| W. Borneo (Sarawak) | 50,000 | 300,000 |
| N. Borneo | 31,106 | 175,000 |
| Australian Colonies | 2,946,691 | 3,036,570 |
| New Zealand | 104,471 | 626,658 |
| Tasmania | 26,215 | 146,667 |
| New Guinea | 90,000 | 350,000 |
| Cape Colony and Dependencies | 221,311 | 1,527,224 |
| Natal | 20,460 | 543,913 |
| W. African Colonies | 84,370 | 4,703,882 |
| Mauritius | 705 | 371,655 |
| Canada | 3,456,383 | 4,833,239 |
| Newfoundland | 42,200 | 202,040 |
| Jamaica and Turk's Island | 4,424 | 644,236 |
| Leeward Islands | 700 | 127,723 |
| Barbadoes | 166 | 182,306 |
| Windward Islands | 508 | 139,697 |
| British Guiana | 109,000 | 278,295 |

The government is a limited monarchy. Besides the Queen and the Ministry, which constitute the executive, there are two houses of Parliament. The upper is the House of Lords, the seats in which are hereditary. The lower house, the Commons, which has by far the greater power, is constituted by popular election. As the ministry resigns when its measures fail of support by the Commons, this house is practically the government. The regular army, exclusive of India, numbers (1894) 154,442 of all ranks; the reserves of the regular army, home and colonial, 224,795; the militia and yeomanry volunteers 414,857. The navy in active service comprises a total of 189 vessels; including those out of commission and under construction, the total number is increased to 486. The capital is London. Other principal cities are Liverpool, Glasgow, Edinburgh, and Sheffield.

G. B. was so called in distinction from Brittany in France. From the union with Scotland, 1707, till that with Ireland, 1801, it was the official designation of the kingdom. Since 1801 the proper style is The United Kingdom of Great Britain and Ireland. Whole extent of the British Empire, including India and other dependencies, 11,421,100 sq. m.: pop. 381,404,960.

**Great Circle Sailing.** Method of making the shortest run between two ports by having the course coincide with a great circle of the earth, since the shortest distance is not along a parallel of latitude, but following an arc of a circle whose plane passes through the two points and the earth's center.

**Great Eastern.** Largest vessel ever launched; 680 ft. long, 83 ft. wide, 58 ft. deep. It was designed by I. R. Brunnel, built on the Thames, Eng., and launched 1858. Its engines were



The Great Eastern.

11,000 horse power, with side wheels and screws; it first crossed the Atlantic 1860, and was broken up 1886. It was used in laying the Atlantic cables 1864–66. Capacity, 19,000 tons.

**Greatest Common Divisor** OF TWO OR MORE QUANTITIES. Largest quantity which exactly divides each of them. It is found (1) by combining in one product all the factors common to the given quantities, (2) by dividing the greater by the less, the divisor of this operation by the remainder, and so on, until an exact division is reached; the divisor in this exact division will be the greatest common divisor of the original divisor and dividend. The successive divisions may be facilitated by suppressing or introducing factors to make the quotients integral.

**Greatest Happiness.** Greatest surplus of pleasure or pain possible, considered as an end of any person's action.

**Great Fish River.** In Northwest Territory, Canada, flowing into Simpson Strait, of the Arctic Ocean. Length ab. 500 m.

**Great Grimsby.** See GRIMSBY.

**Great Harry.** First British warship, built 1438, burned 1533.

**Great Kanawha.** Branch of the Ohio, in W. Va. Its upper part, New River, is of great beauty.

**Great Pedee.** River of N. C. and S. C. It heads in the Blue Ridge, flows s.e. to its mouth, at Georgetown, S. C., and is navigable to Cheraw. Drainage area 17,098 sq. m., length 400 m.

**Great Plains.** E. slope of the Cordilleran plateau, extending from the base of the Rocky Mts., at an elevation of 4,000 to 6,000 ft. e. in a gentle incline to the Missouri, or south of it, to long. 95° or 97°. The e. border merges gradually into the prairie region. Its surface is rolling and treeless. It is underlaid mainly by Cretaceous formations, with Carboniferous appearing in s. Kansas and Indian Territory, and Neocene in n. Kansas, Nebraska, and s. Dakota.

**Great Salt Lake.** In Utah, at w. base of the Wasatch Mts. It receives the drainage of that range and of the e. part of the Great Basin. It has no outlet save by evaporation, and contains ab. 22 per cent of saline matter. It was in Quarternary times much larger, and under the name of Lake Bonneville had an outlet to Snake River. Area 1,900 sq. m., elevation 4,218 feet.

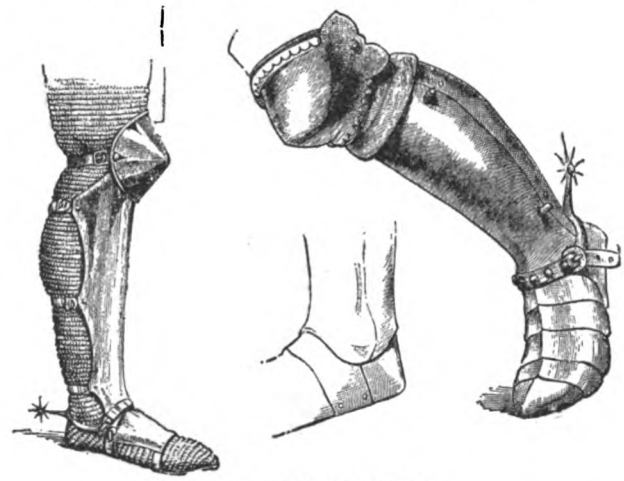
**Great Seal of the U. S.** Adopted June 20, 1782. It has on one side a spread eagle with a shield and a scroll in his beak inscribed with the motto *E pluribus unum*. The other side bears an unfinished pyramid with the All-seeing Eye in a triangle above, and on the rim the words *Annuit Cœptis* and *Novus Ordo Seclorum*. It is kept by the Sec. of State.

**Great Slave Lake.** In Northwest Territory, Canada, on the course of the Mackenzie River. Length ab. 300 miles.

**Great Wall of China.** See CHINA, WALL OF.

**Great Whale River.** In Labrador, flowing w. into Hudson's Bay.

**Greaves.** Armor protecting the leg below the knee. They were worn by the Greeks and Romans, being made of bronze,



Greaves (ab. 1270 and 1400).

brass, silver, or gold, and richly ornamented. Mediæval greaves were developed with the rest of the mail into complete casings.

**Greaves,** JOHN, 1602–1652. Prof. London 1640–43, and Oxford 1643–48; writer on astronomy and antiquarian topics.

**Grebes.** See URINATORES. Birds with long necks, containing 15 to 19 vertebræ; they are powerful divers, using the lobed feet alone. The tarsus is much compressed. During the breeding season the head is adorned with bright crests. They lay their eggs in floating nests, on fresh water. In winter they seek the sea. Ab. 30 species inhabit different parts of the world. The American *Podilymbus podiceps* is the devil-diver or dabchick.

**Grecian Architecture.** See ARCHITECTURE.

**Greece.** Kingdom of southern Europe, s. of Turkey; washed on e., s., and w. by the Mediterranean. The area is 25,353 sq. m., comprising not only the mainland, but numerous islands off the coast. The surface is mainly an alternation of mountains of moderate height and fertile valleys. The coast is very irregular and broken. Agriculture is in a backward condition. There is considerable commerce; currants, olive oil, silk, etc., are exported. The government is a limited monarchy.

The Hellenes, a Pelasgian tribe of the Aryan stock, seem to have settled originally in Epirus. They claimed descent from Hellen, son of Deucalion, and called their district Hellas. Hellen's sons became the Eponymus of the Dorians, Æolians, Ionians and Achæans, whose dialects and institutions differed. A mild climate, a checkered land surface, and excellent harbors tended to produce an independent, bold, and enterprising people. In 12th century B.C. extensive colonization of Asia Minor and the Ægean Islands took place, and later of the whole Mediterranean coast. Common religion, language, and games proved incapable of developing more than an ideal unity. Two distinct politics, Democracy and Oligarchy, divided the sympathies of the different municipalities. The struggle between these two opposing tendencies comprises the internal history of Classic Hellas. Out of this stage she never emerged. Her history is that of her cities, with their varying preponderance. Athens represents the democratic type, Sparta the oligarchic. The Persian War, 500–479 B.C., raised Athens to recognized pre-eminence, especially on the sea. Then followed the period of her glory, the ages of Pericles, 444–429, of Phidias, and of Æschylus. Sparta's jealousy of Athens caused the disastrous Peloponnesian war, 431–404, which resulted in Spartan supremacy. Sparta was successfully opposed by Thebes 370–365. After numerous

bitter rivalries, Philip of Macedon subjected the exhausted states at Chæroneia 338. Then follows the period of Macedonian supremacy. Alexander the Great extended his empire over the East, which might have proved permanent but for his untimely death. Greek civilization was thus spread over the world, and remained dominant. It produced the highest type of Art, Oratory, Philosophy, Drama, History, Science, and has profoundly influenced modern thought.

G. fell an easy prey to Rome 146 B.C., and remained incorporated in the Roman Empire until its overthrow. At the time of the 4th Crusade, 1203, it became a Frankish dukedom. It fell under the Moslem yoke 1453, was reconquered by the Venetians 1689, but lost to the Turks 1718. The war of independence began 1821. The Turkish fleet was annihilated by the Allies at Navarino 1827. Capodistrias was President of G. 1828–31; Otto of Bavaria became King Feb. 1833. A constitution was extorted from him 1843; he was deposed 1862. Prince George of Denmark succeeded Oct. 1863, and is still on the throne. G. is making slow progress in the work of national regeneration. Pop., 1889, 2,187,208.

**Greek Art** (SCULPTURE AND PAINTING). The origins of Greek sculpture are best illustrated by the art of Cyprus (see CESNOLA COLLECTIONS) as far as stone is concerned, but the period of wooden puppets has left no relics. According to present views, stone sculpture was not generally practiced in Greece till the 6th century B.C., and certainly had still a rude or archaic character till 500 B.C. The first important surviving work of dawning perfection is the gable statuary from Ægina, now in Munich, dating ab. 470. Next come the gable sculptures of Olympia, 450, and finally the Elgin Marbles from the Parthenon, ab. 440. We must, however, distinguish between the surviving fragments of Greek art and the original facts. These would place the now unknown CHRYSELEPHANTINE STATUES (q.v.) in the foreground. The 5th century B.C. was the time of sublimity and grandeur in Greek art. The 4th that of elegance and beauty. At its close began the period of expansion and of reproductions, the period of the copies. This was addicted in

Vases of the Richest Style.

its distinctively original works to a more literal and detailed execution than had been previously known. Thus it largely sacrificed the bold and simple style of earlier times to refinements of mechanical execution. See PHIDIAS, POLYCLETUS, MYRON, PRAXILETES, SCOPAS, LYSIPPUS. Greek painting undoubtedly attained supreme perfection, but nothing is left to illustrate its character except the drawings on Greek vases and the frescoes of Pompeii and Rome, the latter not numerous. The perfection of Greek art is not confined to painting and sculpture, but holds of all utensils and other objects in daily use. This perfection consists not only in beauty of form and refinement of execution, but also in self-restraint and simplicity, in a feeling for balance of lines and forms, and in the knowledge that an idea of utility and constructional feeling is necessary to all applications of ornamental art. For a knowledge of many important phases of Greek art we are dependent on the objects of the Roman period found at Pompeii now in Naples. Most of our knowledge of Greek statues is also derived from the Roman copies. The father of the study of Greek art was JOHN WINCKELMANN (q.v.).

**Greek Church,** or HOLY ORTHODOX ORIENTAL CHURCH. That form of Catholicism, independent of Rome, which is the national church of Greece, Russia, Servia, Roumania, Bulgaria, Montenegro, and includes most of the Christian subjects of Turkey. Its chief officer is the Patriarch of Constantinople.

**Greek Colonies.** See COLONIES, GRECIAN.

**Greek Empire.** See EASTERN EMPIRE.

**Greek Fire.** Combustible mixture, probably of sulphur, niter, and naphtha, first used by the Greeks at the siege of Constantinople 673. It was poured from caldrons and ladles, or forced through copper tubes set in prows of vessels. The use of similar compounds in modern times has not been wholly successful. See FIRES, COLORED.

**Greek Games.** See ISTHMIAN, NEMEAN, OLYMPIC, and PYTHIAN GAMES.

**Greek Language.** Once spoken in Greece, Asia Minor Italy (Magna Græcia), Sicily, and other places. It belongs to the South European branch of the Indo-European family, and is famous for the artistic perfection of its structure, both as a means of expressing fine shades of thought, and as a thing beautiful in itself. The Classic period of Greek ended about the time of Alexander. Its chief literary dialect was Attic, a branch of the Ionic; other dialects were the Doric and Æolic. After the time of Alexander Attic Greek became the standard, but it suffered various corruptions, some of which are found in the Greek of the New Testament. Modern Greek differs in many respects from the ancient; it begins ab. 800. In recent times the scattered dialects have been corrected into something like uniformity on the basis of the classical tongue.

**Greek Literature.** The beginnings of literary activity among the Greeks are lost in obscurity; our first monuments are the Iliad and Odyssey, attributed to Homer. The Cyclic poets, now mostly lost, completed the cycle of legends connected with the siege of Troy; these and Hesiod, with other early poets, make the Ionian period, as we call it from the prevailing influence of Asia Minor, rich in literary production. This period was succeeded ab. 500 B.C. by the Attic period, which centered around the inspiration which the chief commercial city of Greece proper exerted. During it lyric poetry reached its climax in Simonides of Ceos at Athens, and in Pindar, who employed the Doric dialect. Tragedy was developed and perfected by Æschylus, Sophocles, and Euripides. Comedy arose under Aristophanes, and passed through three stages or schools, the third of which, led by Menander and Diphilus, has been the model for the modern type of play. Prose began with the historians, among whom Herodotus and Thucydides hold the chief place. Oratory flourished under the democratic rule at Athens, and reached its highest level in Demosthenes, who has never been surpassed. Philosophy, which had arisen before in Asia Minor, was established at Athens; the names of Socrates, Plato, Aristotle, Zeno, and Epicurus stand for schools of thought which have ever since directed or affected later philosophic investigation.

The third or Alexandrian period is so named because the foundation of the great library and museum made Alexandria the chief home of literature for the time between ab. 280 B.C. and the accession of Augustus, 31 B.C. This period was less rich in original works; erudition led to the development of grammatical and linguistic science. The mathematical and physical sciences are represented by many important works, but few imaginative authors deserve mention except the idyls of Theocritus, Bion, and Moschus. Under the emperors literature was studied at Rome, and many Greeks came thither. It was a time of decadence, and Dionysius of Halicarnassus, Josephus, Arrian, and Herodian were the chief prose historians. Lucian, in his satires, displays great talent.

The Byzantine period begins with Justinian, 6th century, and has no writers of great merit to show. The troubled times and the devotion of so many to theological controversy destroyed literary culture, and only histories and collections of the older authors, or commentaries upon them, were produced. This period ends with the fall of Constantinople, 1453. Modern Greece is gradually forming its literary models: Panagiotis and Rangabé have produced poems of merit.

The great works of Greek literature occupy a unique position in the literary history of the world, and have formed the types for all that is great in modern thought and expression.

**Greek Music.** So few are the fragments of music which have come down to us from antiquity that we are thrown upon a study of the theoreticians. That the Hellenes held music in high repute is evidenced by the power ascribed to it in the legends concerning Orpheus, Amphion, Arion, etc., and the facts that its invention and practice was ascribed to the gods, and that it was an integral element of the highest art form known to them, the tragedy. The theoretical writers have been diligently studied, but many questions concerning the ancient practice seem unanswerable. We may assume that vocal music was unisonal; that if a rudimentary harmony existed, it was relegated to the instruments; that, in contradistinction to the music of to-day, the scales were built downward, and were conceived as composed of two groups of four notes each, called tetrachords; that the complete system embraced two modern

octaves, and was divided into modal sections (beginning on different intervals), which gave their names to the ECCLESIASTICAL MODES (q.v.) of the Mediæval theoreticians; that systems of symbols were used for noting vocal and instrumental music, but indicated only pitch, the time being dependent upon the meter of the text; that instruments of the lute kind (kithara, phorminx, etc.,) and pipes (aulos) were used with and without voices; and that a knowledge of music (understood in its wide sense as embracing poetry and the dance) was essential to a polite education. Only two musical monuments of unquestioned authenticity have come down to us; a hymn, supposed to be of date ab. A.D. 100, found 1882 at Tralles, near Ephesus, carved on a small pillar of marble, and a Hymn to Apollo, carved on two marble slabs found in excavating the treasury of the Athenians at Delphi, May, 1893. Some fragments of a tragic ode by Euripides exist, but not extended enough to furnish information. Four transcriptions of Greek hymns have been accepted as genuine, though the manuscripts are not ancient. They are: the opening lines of Pindar's first Pythic ode, pub. 1652, ostensibly from a very old manuscript found in a monastery near Messina, now lost; and three hymns, to Calliope, Apollo, and Nemesis, pub. by V. Gallilei, 1581.

**Greek Mythology.** Probably of Aryan origin, the Greek deities were at first mere personifications of natural phenomena or moral powers. The mother of all was Gæa, the Earth, who bore Uranus, the Sky. To him succeeded his son Kronos, the Harvest god, whose son Zeus, God of the Light of Heaven, finally reigned. The children of Uranus were destructive forces, the TITANS (q.v.), the three-hundred-armed Hekatoncheires (gods of tempest and earthquake), and the three Cyclopes (gods of thunder and lightning). The gods of the first rank, called Olympian deities from their abode, were children either of Kronos or Zeus; viz., Zeus, Hera, Poseidon, Demeter, Hestia, Ares, Hephæstus, Aphrodite, Pallas-Athene, Phoibos, Artemis, Dionysus and Hermes. Hades and Persephone were also included, although their realm was in the under world. Gods of inferior rank independently worshiped were Horæ, seasons; Pomona and Vertumnus, fruits; Priapus, fertility; Pan, herds and pasture; Komos, mirth; Hebe, youth; Æsculapius, healing; Hygeia, health; Nike, victory; Eris, strife; Nox, night; Hypnos, sleep; Eos, dawn; Œlus, wind; Hymen, marriage; and Mœra, fate. Other minor deities were the Satyrs, of the forests; the Oceanides, Nereides, Tritons, and Naiads, of the waters; and the Nymphs, Erynnys, Harpies, Gorgons, Graces, and Muses. Last came the Heroes and Demigods, elevated to the rank of deities and locally worshiped.

**Greek Revolution.** Greece became subject to the Turks 1453, and revolted 1821; 100,000 were massacred in Scio 1822, but the Greeks gained several victories. The Turks took Missolonghi 1826, and Athens 1827. Greece appealed to England, France and Russia. The allied fleet disastrously defeated the Turks at Navarino Oct. 20, 1827, in an unpremeditated conflict, which, with a defeat of the Turks in Bœotia Oct. 7, 1829, paved the way for the independent kingdom of Greece 1830.

**Greeley,** HORACE, 1811–1872. Editor New York *Tribune* from 1841; Presidential candidate 1872. His zeal and energy won the greatest influence in public affairs ever exerted by an American journalist, though his course was at times erratic. Some of his sayings are famous, as "Go West, young man," and "Erring sisters, go in peace" (1861). Among his books are *The American Conflict*, 1864–66; *Recollections of a Busy Life*, 1868; and *What I Know of Farming*, 1871.

**Greely,** ADOLPHUS WASHINGTON, U.S.A., b. 1844. Com-

The Greely Arctic Expedition—the furthest point North.

mander of an Arctic expedition sent out 1881; rescued at Cape Sabine June 22, 1884, with the six survivors of his party, two of whom had reached the highest latitude yet attained, 83° 24′. He was Chief Signal Officer 1887–92. *Three Years of Arctic Service*, 1886.

**Green,** ANNA KATHARINE. See ROHLFS, MRS.

**Green,** ASHBEL, D.D., LL.D., 1762–1848. Pres. Princeton Coll. 1812–22; ed. *Christian Advocate*, 1822–34. *Presbyterian Missions*, 1820.

**Green,** GEORGE, 1793–1841. English mathematician. He discussed in 1827 the fundamental law of force as exerted in electricity, which he called the Potential Function. Gauss in 1839 independently reached the same result, and called it the Potential. G.'s article was pub. 1828, and repub. in *Crelle's Journal*, vols. xliv. and xlvii. His name is preserved in Green's Theorem.

**Green,** JOHN RICHARD, LL.D., 1837–1883. Most popular of recent English historians. With health always feeble, he held parochial charges till 1869, and then became librarian at Lambeth Palace. His *Short History of the English People*, 1874, masterly alike in its scholarship, modernness of thought, and fascinating style, was an instant success. The larger work appeared in 4 vols., 1877–80, and was followed by *The Making of England*, 1882. His *Conquest of England*, 1883, was completed by his widow, ALICE (STOPFORD), b. 1849, who has since carried on his work, and pub. *Henry II.*, 1888, and *Town Life in the 15th Century*, 1894.

**Green,** MATTHEW, 1696–1737. English poet. *The Spleen*, 1737.

**Green,** NORVIN, M.D., 1818–1893. Pres. Western Union Telegraph Co. from 1878.

**Green,** SETH, 1817–1888. Supt. of N. Y. Fisheries 1868; noted for the propagation of shad, which he sent to Cal. 1871. *Trout Culture*, 1870; *Fish-Hatching and Fish-Catching*, 1879.

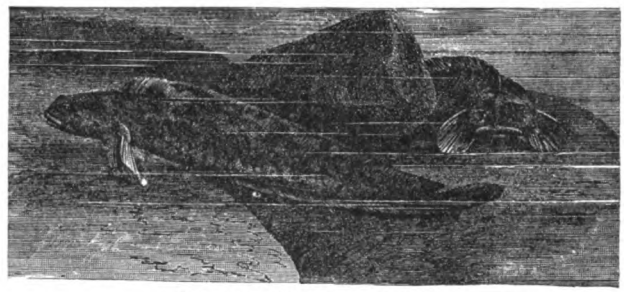
**Green,** THOMAS HILL, LL.D., 1836–1882. Master of Baliol Coll., Oxford, 1870; prof. of Moral Philosophy 1877; celebrated in *Robert Elsmere* as "Gray." *Prolegomena to Ethics*, 1883; *Works*, 3 vols., 1885–88.

**Green,** WILLIAM HENRY, D.D., LL.D., b. 1825. Prof. Princeton Theol. Sem. since 1851; O.T. reviser. *Hebrew Grammar*, 1861; *Pentateuch Vindicated*, 1863; *Job*, 1874; *Hebrew Feasts*, 1885; *Higher Criticism of the Pentateuch*, 1895.

**Green,** WILLIAM MERCER, D.D., LL.D., 1798–1887. P. E. Bp. of Miss. 1849. *Life of Bp. Otey*, 1885.

**Greenbacks.** Bank-notes issued by U. S. Government 1862 and after, backs printed in green: $450,000,000 were authorized 1862–3; gold rose to 285 in 1864, and was at a premium till Dec. 17, 1878. The Greenback party nominated Peter Cooper for Pres. 1876, and cast 81,737 votes for him. In the next two campaigns they showed more strength.

**Greenbone.** Popular name for the viviparous Bleny, *Zoarces viviparus*, found on the n. shores of Europe. Its ven-



Greenbone (*Zoarces viviparus*).

tral fins approach in appearance and function the legs of higher animals. It climbs on the rocks and remains exposed to the air for some time, thus forming an approach to reptile forms of life.

**Greenbrier.** *Smilax rotundifolia*. Prickly vine, natural family *Liliaceæ*, prevalent in low thickets in e. N. America. Known also as Catbrier.

**Greene,** CHARLES EZRA, b. 1842. Prof. of Civil Engineering in Univ. Michigan from 1872. *Graphics for Engineers*, 1880.

**Greene,** FRANCIS VINTON, U.S.A., b. 1850. Author of two books on the Russian Army, 1879–80, of *The Mississippi*, 1882, in *Campaigns of the Civil War*, and of a *Life* of Gen. N. Greene, 1893.—His brother, SAMUEL DANA, U.S.N., 1839–1884, was executive officer of the *Monitor* in her famous battle with the *Merrimac*, in Hampton Roads, Va., March 9, 1862, and thrice prof. at West Point.—Their father, GEORGE SEARS, U.S.A., b. 1801, was engineer of the Croton Aqueduct 1857–61 and 1867–71, and Brig.-gen. U. S. Vols. 1862–65.

**Greene,** GEORGE WASHINGTON, 1811–1883. Historian; U. S.

Consul at Rome 1837–45; prof. Brown Univ. 1848–52, and Cornell 1872. *Middle Ages*, 1851; *American Revolution*, 1865; *Life of Gen. N. Greene* (his grandfather), 1867–71.

**Greene,** NATHANIEL, 1742–1786. General in the American Revolution; distinguished at Trenton and Princeton. In 1780, succeeding Gen. Gates after the defeat at Camden, he reorganized the army and won decisive victories over Cornwallis at Cowpens and Eutaw Springs, ending the war in the South. No name stands higher than his among Washington's lieutenants.

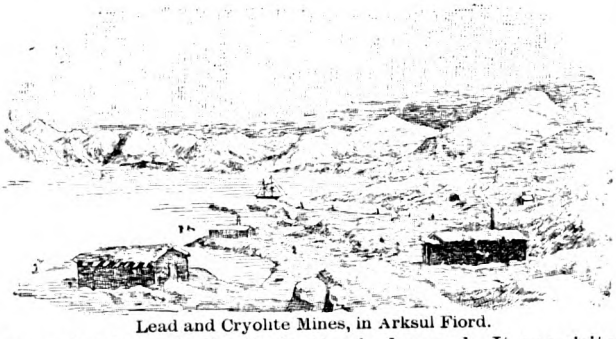
**Greene,** ROBERT, ab. 1560–1592. English dramatist, romancer, poet, and pamphleteer. *Friar Bacon and Friar Bungay.*

**Greene,** MRS. SARAH PRATT MCLEAN, b. 1858. American novelist. *Cape Cod Folks*, 1881; *Towhead*, 1882; *Lastchance Junction*, 1892.

**Green Gland.** Glandular mass in the head of Crayfishes, opening by a duct on base of the antenna; probably a kidney.

**Greenheart.** *Nectandra rodiæi.* Large tree of the Laurel family, native of Guiana; also, *Colubrina ferruginosa*, W. Indian tree of the Buckthorn family.

**Greenland.** Large island n. e. of N. America, stretching up into the Arctic Ocean. It extends from lat. 60° to 84° and perhaps further n., with a breadth of 50° of longitude. The s. portion is habitable along the coast, and contains a few whites of Danish origin; otherwise the inhabitants are Eskimos. The interior is, so far as known, covered with glaciers. It was first landed on ab. 986 by Eric the Red, who was followed by other settlers, until a colony of Norsemen was established. Christianity was introduced 1126; a republican government prevailed until 1261, when it became subject to the King of Norway. About this time the colonists were attacked by the native Eskimo, and also by the Black Death, which nearly caused their extermination. The country was also visited by a hostile



Lead and Cryolite Mines, in Arksul Fiord.

fleet, so that by 1500 all colonization had ceased. It was visited for the next 200 years mainly by Dutch sailors, but no permanent settlements were attempted until 1721, when Hans Egede, a missionary, established himself; through the work begun by him the native population has been civilized and Christianized. Since 1774 the country has been a dependency of Denmark, which assumed the charge of it for the sake of the trade, which had become unprofitable in the hands of private individuals. The settlements now consist mainly of two or three Danish houses connected with the government and superintendence of the trade, and the huts of the natives, from 20 to 400 in each settlement. Nansen crossed G. s. of the Arctic circle 1888, and Peary crossed n. of it 1892.

**Greenleaf,** SIMON, LL.D., 1783–1853. Prof. of Law at Harvard 1833–48. *Law of Evidence*, 1842–53.

**Green Mountains.** Range in Vt., running nearly n. and s. Height 2,000 to 4,390 ft.

**Greenock.** Seaport of Scotland, on the Clyde. It has

Custom House, Greenock.

large shipbuilding interests, and much commerce. In the factories extensive use is made of water power furnished by a corporation. It has large sugar refineries. James Watt, 1736–1819, was born here. Pop., 1891, 63,498.

**Greenockite.** CdS or $Cd_3S_3$. Rare mineral combination of cadmium and sulphur.

**Greenough,** GEORGE BELLAS, 1778–1855. First pres. Geological Society of London, which owed its existence largely to his efforts.

**Greenough,** HORATIO, 1805–1852. American sculptor, designer of the colossal marble Washington in the grounds of the Capitol, and of the Bunker Hill Monument.—His brother, RICHARD SALTONSTALL, b. 1819, has produced statues of Winthrop and Franklin, and many other works.

**Green River.** Larger of the two head branches of the Colorado. It heads in the Wind River Mts. in w. Wyoming, and flows generally s., joining Grand River in s.e. Utah. For 150 m. below its head it flows through an open desert valley, the Green River basin, then cuts a gorge through Uinta Mts. Thence its course is a succession of cañons in inclined plateaus, dipping north. Drainage area 47,222 sq. m.

**Green River.** In Ky.; branch of the Ohio; drainage area 7,800 sq. m. It affords slack water navigation to Bowling Green.

**Greenroom.** Apartment off the stage where the actors congregate while waiting: it was originally painted green.

**Green Sand.** Glauconite; hydrous, earthy, potassium and iron silicate of a dull greenish color. The green sand marls of the N. J. Cretaceous formation have long been used as a fertilizer, containing calcium phosphate and potash. Deposits of similar character, but richer in phosphorus, have more recently come into notice in Ga. and Ala.

**Green Sickness.** See CHLOROSIS.

**Greenstick Fracture.** See FRACTURE.

**Greenstone.** Rocks which are mixtures of some species of feldspar, with pyroxene or hornblende as essential ingredients; their dark green color they owe to hornblende and to a small admixture of chlorite.

**Green Vitriol.** See FERROUS SULPHATE.

**Greenwell,** DORA, 1821–1882. English sacred poet. *Carmina Crucis*, 1869.

**Greenwich.** Borough of England, on the Thames, 5 m. below London. It is known mainly as the site of the royal

Greenwich Hospital.

observatory and the location of the initial meridian of longitude. The hospital, founded 1694 for disabled sailors, was turned into a naval college 1873. Pop., 1891, 78,131.

**Greenwich.** Town of Fairfield co., Conn., on Long Island Sound, 28 m. n.e. of New York. Pop., 1890, 10,131.

**Greg,** WILLIAM RATHBONE, 1809–1881. English essayist and official. *Creed of Christendom*, 1851; *Literary and Social Judgments*, 1869; *Political Problems*, 1870; *Enigmas of Life*, 1872; *Rocks Ahead*, 1874; *Mistaken Aims*, 1876.

**Gregarinidæ** (GREGARINES). Wormlike *Sporozoa*, consisting of one nucleated cell, which in the *Haplocyta* or *Monocystidea* is simple, and in the *Dicystidea*, *Polycystidea*, or *Septata* is divided into two or more parts. They are almost all parasitic in the internal organs and intestines of Worms and Arthropods, and vary in length from microscopic dimensions to half an inch. They have no cilia or other organs, except sometimes hooks, by which they can hold on to the intestinal wall. They reproduce mostly by spores (see PSEUDONAVICELLÆ), and sometimes alternate with this method a process of budding (see PSEUDOFILARIÆ). Encystation and conjugation are also frequent. See PSOROSPERMS.

**Gregarinidea.** See SPOROZOA.

**Gregg,** DAVID MCMURTRIE, U.S.A., b. 1833. Gen. U. S. Vols. 1862–65.—His cousin, JOHN IRVIN, U.S.A., 1826–1892, also commanded a brigade in the Civil War.

**Gregg,** WILLIAM, D.D., b. 1817 in Ireland. Prof. Knox Coll., Toronto, 1872. *Hist. Presbyterian Ch. in Canada*, 1885–92.

**Grégoire,** HENRI, 1750–1831. French priest and democrat, prominent in the States-general from 1789; constitutional Bp. of Blois 1790; Senator 1801. *Hist. des Sectes*, 1814; *Libertés de l'Eglise Gallicane*, 1818; *Mariage des Prêtres*, 1826.

**Gregorian Chant.** The hymns which are at the base of the ritual of the R.C. Ch. have been called Gregorian for centuries, on the strength of a tradition that their ordering was the work of Pope Gregory the Great. GEVAERT (q.v.) has dealt the tradition a blow which threatens it with ruin. The term will remain, nevertheless, though the credit of the regulation of the hymns may be shifted from Gregory I. to the second or third pope of that name. See ECCLESIASTICAL MODES.

**Gregorian Telescope.** Form of reflecting telescope in which the rays from the large mirror are reflected back through a hole in its center to the eyepiece by means of a small concave mirror placed near the focus.

**Gregorius Nicephorus,** b. 1295. Byzantine historian of the period 1204–1359.

**Gregorovius,** FERDINAND ADOLF, 1821–1891. German historian, poet, and critic. *Rome in the Middle Ages*, 8 vols., 1859–72.

**Gregory I.,** ST., "THE GREAT," ab. 540–604. Founder of the Mediæval form of Roman Catholicism, Prefect of Rome 573, Pope 590. Eminent as a theologian, but chiefly as an administrator. He sent Augustine to England 596. Vasari's picture illustrates the legend that Gregory always had twelve beggars

St. Gregory's Supper, by Vasari (Bologna Gallery).

to sup with him, and one night Christ made the thirteenth guest at table.—II. Pope 715–731.—III. 731–741.—IV. 827–844.—V. Bruno, a German, Pope 996–999.—VI. John Gratianus, d. 1048, Pope 1044–46; also an Antipope, 1012.—VII. Hildebrand, Pope 1073–85, the great assertor of papal claims against the emperors, famous for his long quarrel with Henry IV., whom he humiliated at Canossa and repeatedly excommunicated.—VIII. Alberto de Mora, Pope 1187; also Bourdin, Abp. of Braga 1110, Antipope 1118, d. 1122.—IX. Ugolino, Count of Legni, Pope 1227–41. He issued the Decretals 1234, and excommunicated Frederic II. four times, ruining the 5th Crusade, 1228.—X. Tebaldo Visconti, Pope 1271–76.—XI. Pierre Roger de Montrony, 1329–1378, Cardinal 1348, Pope at Avignon 1370, in Rome 1377.—XII. Angelo Corraro, ab. 1325–1417, Pope 1406, deposed 1409, abdicated 1415, Bp. of Porto.—XIII. Ugo Buoncompagno, 1502–1585, Pope 1572–85. He celebrated the Massacre of St. Bartholomew with processions and medals, edited the canon law, and reformed the calendar 1582.—XIV. Niccolo Spondrato, 1535–1591, Pope 1590–91.—XV. Alessandro Ludovisio, 1554–1623, Pope 1621–23.—XVI. Bartolommeo Capellari, 1765–1846, general of the Camaldulians, Prefect of the Propaganda, Pope 1831–46.

**Gregory,** DAVID, F.R.S., 1661–1708. Prof. Edinburgh 1684 and Oxford 1691; ed. Euclid; Latin writer on geometry and astronomy.—His uncle, JAMES, 1638–1675, prof. St. Andrew's 1669 and Edinburgh 1674, invented the reflecting telescope 1662, and wrote on geometry.—His grandson, JOHN, 1724–1773, was Prof. of Medicine at Aberdeen 1755 and Edinburgh 1766, and a writer of professional works, as was his son, JAMES, 1753–1821.

**Gregory,** OLINTHUS, 1774–1841. Prof. Woolwich 1807–38; writer on mathematics. *Evidences of Christianity*, 1810.

**Gregory Nazianzen,** ST., ab. 330–390. Cappadocian, Patriarch of Constantinople 381 for a few months only; one of the chief Greek Fathers. He left poems, letters, and orations.

**Gregory of Nyssa,** ST., ab. 334–ab. 395. Brother of St. Basil; Bp. of Nyssa in Cappadocia 372; eminent Nicene champion. His chief work is *Against Eunomius*.

**Gregory of Tours,** ab. 538–594. Roman of Gaul, Bp. of Tours 573, noted for his *Annales Francorum*.

**Gregory Thaumaturgus,** ST., ab. 210–270. Bp. of Neocesarea, in Pontus, 240, author and active missionary.

**Gregory the Illuminator,** ab. 257–332. Patriarch of Armenia 302, the first Christian state, converted chiefly by his means. He left *Homilies*.

**Greifswald.** Town of Pomerania, Prussia, on the Ryck; member of the Hanseatic League 1250; held by Sweden 1648–1815. Its university, founded 1456, had, in 1894, 775 students and a library of ab. 135,000 vols. Pop., 1890, 21,633.

**Greiz.** Manufacturing town in the principality of Reuss, on the White Elster, 49 m. s.s.w. of Leipzig, Prussia, with cotton, woolen and other industries. Pop., 1890, 20,100.

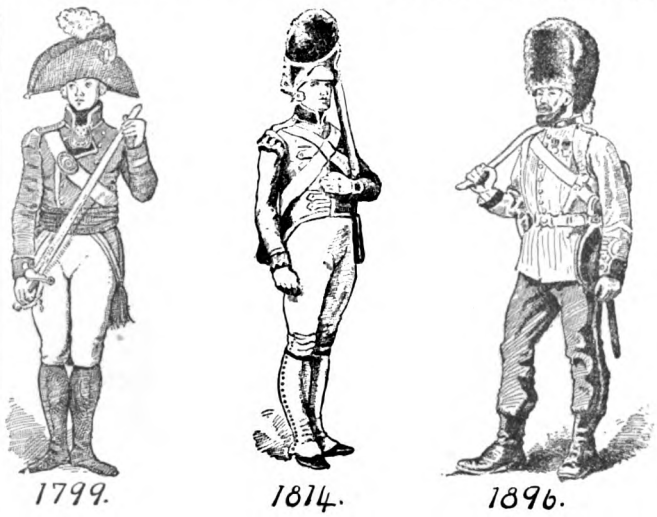
**Grell,** AUGUST EDUARD, 1800–1886. German composer of cantatas, a mass, an oratorio, and other vocal works.

**Grellet,** STEPHEN, 1773–1855. French-American Quaker preacher and philanthropist.

**Grenada.** Volcanic island in W. Indies, 90 m. n.n.w. of Trinidad; settled by the French 1661, held by England since 1783. Area 133 sq. m.; pop., 1891, 54,062, mostly negroes.

**Grenade.** Spherical shell intended to be thrown by hand over a parapet at the instant that troops are making an assault in mass. It is exploded either by percussion or by a lighted fuse.

**Grenadiers.** Originally, French soldiers designated to throw grenades on the enemy in their assaults during a siege.




British Grenadiers.

They carried a leathern pouch holding 12 or 15 grenades, and at first were armed with a hatchet and saber, but later with a

musket. In 1667 each regiment had but four grenadiers; in 1670 one company of the king's regiment was composed of them, and soon after each of the thirty oldest French regiments was likewise provided with a company. Chosen from the tallest and best soldiers, they were given extra pay and assigned as guards to the colors and to special posts of honor. They were entitled to wear the red epaulet and the bearskin shako, but in time the latter assumed such immense proportions as to become ridiculous. La Tour D'Auvergne, named by the First Consul as First Grenadier of the Republic, was distinguished alike for his modesty and bravery; he was killed June 27, 1800, and thereafter up to 1814 at every roll-call of his company the color-bearer answered to his name, "Dead on the field of honor." Now applied in the British army to the regiment of the Grenadier Guards.

**Grenoble.** Ancient city of France, on the Isère, 59 m. s.e. of Lyons. It has a small university, a cathedral of the 15th century, and extensive manufactures of kid gloves. Pop., 1891, 60,439.

**Grenville,** GEORGE, 1712–1770. M. P. 1741; Sec. of State 1762; Prime Minister 1763–65. His rule was odious to the Whigs, and by passing the Stamp Act estranged the American colonists.—His son, WILLIAM WYNDHAM, 1759–1834, became M. P. 1782, Speaker 1789, Baron G. 1790; was Foreign Sec. 1791–1801, and Prime Minister 1806–7.

**Grenville,** SIR RICHARD, 1540–1591. English naval hero, knighted ab. 1577; mortally wounded in action off the Azores, with a Spanish fleet of ten times his strength. His dying speech is famous as a model of chivalric sentiments.

**Gresham,** SIR THOMAS, 1519–1579. English King's merchant at Antwerp 1551–67; knighted 1559; founder of the London Royal Exchange 1566–71, and by will of Gresham Coll.

**Gresham,** WALTER QUINTON, 1832–1895. Gen. U. S. Vols. 1863–66; U. S. Judge, District of Indiana, 1869–82, and 1884–93; Postmaster-gen. 1882–84; Sec. of Treasury 1884; Sec. of State 1893.

**Gresham College.** In London. Lectures by 7 professors, one each day of the week, were begun 1597. From 1768 to 1843 these were delivered at the Royal Exchange, and since then in a hall in Basinghall St.

**Gresham's Law.** Of two kinds of money circulating together, the inferior will drive out and replace the better. Long accepted as of unquestionable worth, closer investigation has shown reasons for its modification, and thrown doubts on its accuracy. Named from Sir Thomas.

**Gresset,** JEAN BAPTISTE LOUIS DE, 1709–1777. French poet, a Jesuit in early and later life. During the intervening secular period he wrote *Vert-Vert*, 1734, *Edward III.*, 1740, *Sidney*, 1745, and *Le Méchant*, 1747.

**Gressoria.** *Orthoptera* with walking legs. The MANTIDÆ and PHASMIDÆ (q.v.) are included.

**Gressorii.** Walking legs of birds, having the inner toe placed behind and three toes forward, the middle and outer being fused as far as the middle.

**Gretna Green.** Village on the Scottish border, in Dumfriesshire, where runaway marriages from England were contracted by declaration in the presence of a witness, in accordance with Scotch law. By an act passed 1856 these marriages were made invalid, unless one of the parties had resided 21 days in Scotland.

Gretna Green in 1800.

**Grétry,** ANDRÉ ERNESTE MODESTE, 1741–1813. Composer of 50 French operas, one of which, *Richard Cœur-de-Lion*, is still on the active list in France. He was an advanced thinker in music, almost fanatically devoted to truthfulness of declamation as distinguished from mere melody making; his *Mémoires ou Essais sur la Musique*, 4 vols., 1796, though a striking monument to his vanity, is full of valuable suggestions. The Belgian government is publishing a complete collection of his works.

**Greuze,** JEAN BAPTISTE, 1725–1805. French genre and portrait painter; good colorist.

**Greville,** CHARLES CAVENDISH FULKE, 1794–1865. English diarist; clerk of the Privy Council 1821–60. *Memoirs*, 3 vols., 1865–87.

**Greville,** FULKE, LORD BROOKE, 1554–1628. English dramatist and poet, biographer of Sir P. Sidney.

**Greville,** HENRY. See DURAND, MME. ALICE.

**Greville,** ROBERT KAYE, 1794–1866. Prof. Edinburgh. *Scottish Cryptogamic Flora*, 1823–29; *Flora Edinensis*, 1824; *Algæ Britannicæ*, 1830.

**Grevy,** FRANCOIS PAUL JULES, 1807–1891. Pres. French Assembly 1871 and 1876; third Pres. of the Republic 1879–87.

**Grey,** CHARLES, EARL, 1764–1845. M. P. 1789; Foreign Sec. 1806; Earl 1807; leader of the Whigs; Prime Minister 1830–34. After much public disturbance, he forced the Lords to pass the Reform bill June 4, 1832.—His son, HENRY, 1802–1882. M. P. 1826, was Sec. for War 1835–39, and for the Colonies 1846–52. *Parliamentary Government*, 1858; *Free Trade*, 1881.—His cousin, SIR GEORGE, 1799–1882, was M. P. 1832–74, Home Sec. 1846–52, 1855–59, 1861–66, and Colonial Sec. 1854–55.

**Grey,** SIR GEORGE, LL.D., b. 1812 in Ireland. Gov. of South Australia 1841–45, of New Zealand 1846 and 1861–67, of the Cape of Good Hope 1854–58; Premier of New Zealand 1877–84. His influence and usefulness there were great. *Polynesian Mythology*, 1855.

**Grey,** LADY JANE, 1537–1554. Daughter of the Duke of Suffolk, and great-granddaughter of Henry VII.; highly educated; wife of Lord Guildford Dudley 1553; chosen by Edward VI. as his successor. She reluctantly allowed herself to be proclaimed queen July 10, 1553, ten days before Mary assumed the crown; was confined in the Tower, tried for treason Nov. 30, and executed with her husband Feb. 12, 1554.

Execution of Lady Jane Grey, by Delaroche.

**Greyhound.** Slender, long-legged, swift race of dogs, already a distinct breed 1000 B.C. in Egypt. The Irish wolfdog used to hunt wolves, and its descendants, used for coursing deer, were wiry-haired and remarkably large and strong. Modern breeds are far inferior. They have lost the power of scent, and hunt by sight. The Italian Greyhound is a pet of ladies. The color is various.

**Greytown.** Seaport in s.e. Nicaragua at the mouth of the San Juan. It exports rubber and mahogany, principally to the U. S. Pop. ab. 15,000.

**Greywackë.** German argillaceous sandstone; formerly, some of the most ancient fossiliferous strata.

**Gribeauval's System of Artillery.** In 1765 General Gribeauval instituted many much-needed improvements in the personnel and materiel of the French Artillery. In field artil-

lery he discarded all pieces of greater caliber than the 12-pounder, thus giving it greater mobility; made the carriages of a uniform model with interchangeable parts, introduced iron axles, replaced the shafts by poles, harnessed the horses in pairs instead of in file, and supplied ammunition-boxes to the carriages. Batteries of six guns replaced the regimental guns, and horsing by contract was superseded by a well-drilled corps of drivers. This increased mobility and more efficient organization bore excellent fruit in the Napoleonic Wars. Similar modifications simplified the Siege Artillery, which comprised the 12 and 16-pounder guns, the 8-inch howitzer, and 10-inch mortar.

**Griboiedoff,** ALEXANDER, 1792–1829. Russian dramatist.

**Gridiron Valve.** Form of valve for admission of steam to an engine cylinder, in which a number of ports or openings are separated by bars or bridges of the same thickness, and where a similar arrangement of ports and bars exists on the valve seat. Then for a given length of port and port area required, the valve need only be moved over a distance which bears to the motion necessary to give that area with one port the relation which unity bears to the number of ports in the gridiron valve: *e.g.*, if there are three ports, the valve need be moved only ⅓ of the distance necessary with a one-ported valve opening the same area. Its advantages are the diminished work on the valve gear, and large port areas rapidly opened.

**Grieg,** EDVARD, b. 1843. Norwegian composer of music of great originality and real poetical charm, chiefly for the pianoforte.

**Griesbach,** JOHANN JAKOB, 1745–1812. N. T. textualist, prof. at Halle 1773, Jena 1775. His Greek Testament, 1775, is of historic value.

**Griffe.** Projecting ornament at the base of a column, whether it be in the form of a claw, or of a leaf or other decorative form.

**Griffenfeld,** PETER SCHUMACHER, COUNT, 1635–1699. Chancellor of Denmark 1673–76; author of a national code 1665; ennobled 1670; imprisoned from 1676.

**Griffin.** Composite animal of classical mythology, having the head and wings of an eagle and the body of a lion, believed to have been borrowed by the Greeks from Asia. It appears upon Babylonian monuments, and is frequently represented upon the seal cylinders of the Hittites. Used as an Heraldic charge.

Griffin.

**Griffin,** CHARLES, U.S.A., 1826–1867. Brig.-gen. of Vols. 1862–66.

**Griffin,** EDWARD DORR, D.D., 1770–1837. Pres. Williams Coll. 1821–36; eminent preacher. *Lectures*, 1813.

**Griffin,** GERALD JOSEPH, 1803–1840. Irish novelist. *Colleen Bawn*, 1828; *Collegians*, 1828.

**Griffin,** ORDER OF THE. Founded 1884 in Mecklenburg-Schwerin.

**Griffis,** WILLIAM ELLIOTT, D.D., b. 1843. American author, in Japan 1870–74. *Mikado's Empire*, 1876; *Corea*, 1882–84; *Japan*, 1892.

**Griffiths,** JOHN WILLIS, 1809–1882. American naval architect.

**Grigg,** JOSEPH, ab. 1720–1768. English hymnist.

**Grijalva,** JUAN DE, ab. 1490–1527. Spanish explorer in Yucatan and Guatemala.

**Grillage.** Wooden platform built on piles, and serving as the base for the foundation of a wall or pier.

**Grille.** In Architecture, open grating of metal, sometimes of highly ornate and fantastic design, especially frequent in Mediæval and Renaissance work.

**Grillparzer,** FRANZ, 1790–1872. Austrian dramatist and poet. *Sappho*, 1819; *Golden Fleece*, 1822; *King Ottokar*, 1825; *Melusina*, 1833; *Waves of Love*, 1840; *Dream of Life*, 1840.

**Grimaldi,** JOSEPH, 1779–1837. English clown, familiar, chiefly in pantomime, from infancy till 1828.

**Grimes,** JAMES WILSON, LL.D., 1816–1872. Gov. of Iowa 1854–58; U. S. Senator 1859–69. He opposed the impeachment of Pres. Johnson.

**Grimké,** ANGELINA EMILY (MRS. T. D. WELD), 1805–1879. Daughter of Hon. John F. Grimké, LL.D., 1752–1819, of Charleston, S. C., m. 1838; abolitionist.—Her sister, SARAH MOORE, 1792–1873, was also active against slavery and for woman's rights.—Their brothers, THOMAS SMITH, LL.D., 1786–1834, and FREDERICK, 1791–1863, were noted lawyers.

**Grimm,** FRIEDRICH MELCHIOR, BARON VON, 1723–1807. German letter-writer, Minister of Saxe-Gotha to France 1776–92. His *Correspondence*, pub. 1829, filled 16 vols.

**Grimm,** JAKOB LUDWIG KARL, 1785–1863. Prof. at Göttingen 1830–37, and Berlin from 1841. His German Grammar, 1819–40, and Dictionary, 1854–85, are of great value. *Mythology*, 1844; *Hist. German Language*, 1848. Through life he was closely associated with his brother, WILHELM KARL, 1786–1859, who was also prof. at Göttingen and Berlin, and wrote much on ancient German poetry and legends. The two compiled the famous *Fairy Tales*, 1812.

**Grimmelshausen,** JOHANN JAKOB CHRISTOF, ab. 1625–1676. German novelist.

**Grimm's Law.** Most important philological discovery of this century, guessed in part by Rask, but worked out by Jakob Grimm, and called by him *Lautverschiebung*, sound-shifting. By this law, certain consonants in Sanskrit, Greek, and Latin (the first stage), are represented by regularly-related sounds in oldest German, Gothic, Anglo-Saxon, etc. (the second stage). 1. The surd explosives *p, t, k*, of the first stage, become *f, th, h*, in the second stage; cf. Latin *tres* with English *three*. 2. The sounds *f, th, h* (in oldest forms *bh, dh, gh*), of the first stage, become *b, d, g*, in the second stage: cf. *frater* with *brother*. 3. The sonant explosives *b, d, g*, of the first stage, pass into *p, t, k*, of the second stage: cf. Latin *duo* with English *two*. Certain apparent exceptions have lately been explained as perfectly regular by Verner's Law. There has been a second sound-shifting from the second stage to a third, that of High German. Thus Latin *tu*, English *thou*, German *du;* while English *t, p, d* often become *z* (ts), *pf*, and *t*, along with other changes.

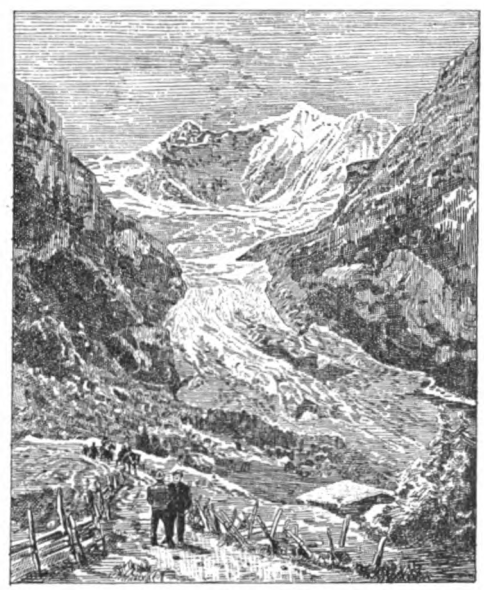
**Grimoire.** Formulary used by magicians and sorcerers to evoke the dead and evil spirits: called also the Devil's Alphabet.

**Grimsby.** See GREAT GRIMSBY.

**Grimshaw,** ROBERT, b. 1850. American writer on mechanics and engineering. *Saws*, 1880; *Scientific Progress*, 1891.

**Grindal,** EDMUND, ab. 1519–1583. Bp. of London 1559, Abp. of York 1570, and of Canterbury 1575; suspended and confined 1577–82 for defending the rights of the clergy.

**Grindelwald.** Village in the Bernese Oberland, Switzerland, at an altitude of ab. 3,500 ft., at the foot of the Schreckhorn. The most easily accessible and lowest-descending of all Swiss glaciers is close by. Pop. ab. 4,000.



Grindelwald Glacier.

**Grinding.** Operation of bringing two surfaces to a tight

joint by abrasion. When possible, it is best to grind the two upon each other, using silica or successively finer grades of emery, held by oil or soap, until contact is uniform all over. For hardened steel work, exterior surfaces are ground by emery-wheels, and hollow cylinders by a lead lap with emery.

**Gringoire,** PIERRE, ab. 1476–ab. 1545. French poet and satirist. *Works*, 4 vols., 1858–77.

**Grinnell Land** (GRANT LAND, ELLESMERE LAND, NORTH LINCOLN). Different parts of a large island, in Arctic North America, w. of Smith Sound; examined 1854 and 1882.

**Gripes.** Colic, especially when accompanied or followed by diarrhœa. In horses and mules, sudden and violent colic, often causing death in a short time; best relieved by laudanum, chloroform, ether, hot ginger-tea, or sweet spirits of niter.

**Grip of a Rivet.** Distance between the two heads after the rivet is in place.

**Griqualand,** EAST. Dependency of Cape Colony, in lat. 30–32° S., long. 28–30° E.; annexed 1875. Area 7,594 sq. m.; pop. ab. 155,000, including over 5,000 whites.

**Griqualand,** WEST. Part of Cape Colony, in lat. 27–29° S., long. 22–25° E.; annexed 1871, incorporated 1880. Area 15,197 sq. m.; pop. ab. 84,000, one-third white.

**Grisaille.** Style of painting used to represent solid bodies in relief, such as friezes, moldings, ornaments of cornices and bas-reliefs, by means of gray tints. *En grisaille* is sometimes misapplied to the artist's first rough sketch in brown of a picture.

**Grisebach,** AUGUST HEINRICH RUDOLF, 1814–1879. Prof. Göttingen 1841. *Travels in Rumelia*, 1841; *Floræ Rumelicæ*, 1843–45; *Flora of British W. Indies*, 1864; *Vegetation of the Earth*, 1872.

**Griselda.** Legendary heroine, celebrated by Boccaccio, Petrarch, and Chaucer; model of domestic patience and slavish submission, much admired by those who regard woman as essentially subservient to man.

**Grisi,** GIULIA, 1812–1869. Opera singer, from 1834–61 one of the idols of the London stage. In 1836 she married Count de Melcy, and in 1856 the tenor Mario. She was in America 1854.

**Gris Nez,** CAPE. On the Straits of Dover, France, with a lighthouse visible 22 m.

**Grisons.** Canton of e. Switzerland, area 2,773 sq. m.; capital Chur. It is traversed by spurs of the Rhætian Alps. It comprises the ENGADINE (q.v.), and contains the sources of the Rhine. The scenery is magnificent, and cattle forms the principal wealth of the inhabitants, who speak German and Italian. The canton contains 240 glaciers. Pop., 1888, 94,800.

Grisons—The Via Mala.

**Griswold,** ALEXANDER VIETS, D.D., 1766–1833. P. E. Bp. of the Eastern Diocese, including all New England but Conn., from 1811.

**Griswold,** MATTHEW, LL.D., 1714–1799. Gov. of Conn. 1784–86.—His son, ROGER, LL.D., 1762–1812, was M. C. 1795–1805, Justice Conn. Supreme Court 1807, and Gov. 1811.

**Griswold,** RUFUS WILMOT, D.D., 1815–1857. American journalist and compiler. *Poets and Poetry of America*, 1842; *Prose Writers*, 1846; *Female Poets*, 1848; *Sacred Poets*, 1849. He incurred much unjust odium by the Life prefixed to Poe's works, 1850.

**Grit.** Any quartzose sandstone suitable for grindstones.

**Grizzly.** Arrangement of grates or bars for disposing of the heavier stones that accumulate in sluices in hydraulic mining.

**Groat.** English silver coin (4 d.) from ab. 1340. On the Continent it was opposed to bracteates, *i.e.*, thin plates stamped on one side only.

**Gröber,** GUSTAV, b. 1844. Prof. Breslau 1874, Strassburg 1882; ed. *Zeitschrift für Romanische Philologie* from 1876.

**Grochow.** In Poland, near Warsaw; scene of a battle between Poles and Russians Feb. 19 and 20, 1831.

**Grocyn,** WILLIAM, 1442–1519. First Greek teacher at Oxford 1492.

**Grodno.** Russian town, on the Niemen, 533 m. s. w. of Warsaw, a large grain center. Pop., 1891, 49,950.

**Groin.** Portion of the body where the abdomen and thigh come together.

**Groin.** In Architecture, line of intersection of two vaults.

**Groin Point.** See GROIN.

**Groined Arch.** In late Gothic, arch turned between two walls, or between a pier and a wall, dividing the vaulting into bays. In the earlier vaulting this division was not marked. It forms a prominent feature in the roofs of Gothic cathedrals.

**Groined Ceiling.** In English Gothic Architecture, an imitation in timber of stone vaulting, in which the ribs were composed of heavy beams, in form like those of masonry, and the cells of light boards. The principal example is that in Winchester Cathedral.

**Groined Vaulting.** Construction of intersecting vaults. See GOTHIC ARCHITECTURE.

**Grolier de Servier,** JEAN VICOMTE D'AGUISY, 1479–1565. French Envoy in Italy, and treasurer. His library, sold 1675, is famous for its rich bindings. The N. Y. Grolier Club is named from him.

Grolier Binding.

**Gromiidea.** Order of imperforate *Foraminifera*, having chitinous shells, smooth or incrusted with foreign particles. There may be an aperture at one end or both. *Microgromia* is a small, pear-shaped, smooth-shelled organism, which forms loose colonies by union of the pseudopodia of adjacent individuals.

**Gromwell.** Plants of the genus *Lithospermum*, of the Borage family, bearing insignificant flowers and rough leaves, natives of the n. hemisphere; called also Puccoon. The plant has a smooth stony fruit.

**Gromwell,** FALSE. Species of *Onosmodium*, coarse plants of the Borage family, natives of N. America.

**Groningen.** Agricultural province of Holland, with shipbuilding and manufacturing industries. Area 887 sq. miles, pop., 1890, 275,356, mostly Frisians, and of Reformed Church. —Also capital of a province of the Netherlands; seat of a university, founded 1614, with 360 students. Pop., 1890, 56,413.

**Gronovius,** JOHANN FRIEDRICH, 1611–1671. Prof. Deventer 1643 and Leyden 1658; editor of many Latin authors, as was also his son, JAKOB, 1645–1716, prof. Leyden 1679. *Thesaurus Antiquitatum Græcorum*, 13 vols., 1697–1702.—Of his sons, ABRAHAM, 1694–1775, edited Tacitus; JOHANN FRIEDRICH, 1690–1760, pub. *Flora Virginica*, 1743, and *Flora Orientalis*, 1765. —Johann's son, LAURENZ, 1730–1778, wrote on zoölogy and ichthyology.

**Gros,** ANTOINE JEAN, BARON, 1771–1835. French military and portrait painter, ennobled 1824; an artist of great power,

Francis I. and Charles V. visiting the tombs of St. Denis (Louvre Gallery).

especially apparent in his drawings. His portrait of Charles X. and a Hercules, exhibited in 1835, were so severely criticised that he drowned himself.

**Grosbeaks.** Finches with beaks extraordinarily stout, forming a continuous curve with the top of the head. The Cardinal Grosbeak is known as the Winter Redbird. In e. U. S. are also the Blue, Rose-breasted, and Pine grosbeaks, all beautifully colored and fine singers. See FINCH.

**Groschen.** Base silver coin of sundry German States prior to 1876; $\frac{1}{30}$ thaler, value ab. $2\frac{1}{3}$ cents.

**Grose,** FRANCIS, 1731–1791. English antiquarian, celebrated by Burns as "a chield amang you." *Dict. Vulgar Tongue*, 1785; *Provincial Glossary*, 1787.

**Gross,** SAMUEL DAVID, M.D., D.C.L., LL.D., 1805–1884. Prof. of Surgery Univ. Louisville 1840, and Jefferson Medical Coll., Phila., 1856–82; author of important professional works. *System of Surgery*, 1859.

**Grossbeeren.** Prussian village, 10 m. from Berlin; scene of a defeat of the French under Oudinot, with loss of artillery and 2,000 prisoners, Aug. 23, 1813, by the Prussians under Von Bülow.

**Grosseteste,** ROBERT, ab. 1175–1253. Bp. of Lincoln 1235; author, reformer, and enemy of nepotism.

**Grosseto.** Fortified town of Tuscany, Italy, 40 m. s.w. of Siena, with a fine cathedral. It is very unhealthy. Pop., 1890, 7,400.

**Grossi,** TOMMASO, 1791–1853. Italian poet and romance-writer. *Ildegonda*, 1820; *Marco Visconti*, 1834; *Ulrico e Lida*, 1837.

**Grossjägerndorf.** German village, scene of a Russian victory over Prussians under Lewald, Aug. 30, 1757.

**Gros's Salt.** Compound discovered 1837, having the composition $PtCl_2(NH_3)_4(NO_3)_2$.

**Grossularite.** Light-colored calcium aluminium garnet; named as resembling the gooseberry in color.

**Grosvenor,** EDWIN A., b. 1845. Prof. Robert Coll., Constantinople, 1873–90, Smith Coll., Mass., 1892–94, and Amherst 1895. *Constantinople*, 1895.

**Gros Ventres.** Arapahoes; so called by the French.

**Grote,** GEORGE, LL.D., D.C.L., 1794–1871. M. P. 1832–41; Pres. Univ. Coll., London, 1869. His *Hist. of Greece*, 12 vols., 1846–56, was notable for scholarship and liberal opinions, and is still widely read. *Plato and Other Companions of Socrates*, 3 vols., 1865; *Aristotle*, 1872.—His wife, HARRIET (LEWIN), 1792–1878, pub. Lives of him, 1873, and Ary Scheffer, 1860.

**Grotefend,** GEORG FRIEDRICH, 1775–1853. German philologist who deciphered the cuneiform alphabet 1802.

**Grotesque.** Style of decorative designs, originally borrowed from Antique baths and grottoes, using griffins, masks, fauns, and combinations of animal or human form with acanthus foliation; now, any decorative design of the human or animal form which departs from literal nature by fantastic additions, deviations, or combinations. In decorative art it has a well-defined and important place. It gives effect to forms seen at a distance, and in carving it bespeaks sympathy with the texture and solidity of the material.

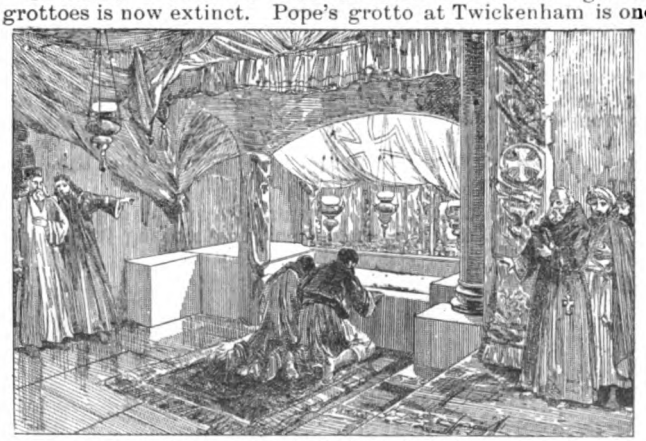
Grotesque Salt-cellar—Augsburg, 16th cent. gold, shell, and jewel work.

**Groth,** KLAUS, b. 1819. Prof. Kiel 1866; author of tales and poems, chiefly in Low German. *Quickborn*, 1852; *Vertelln*, 1855-59; *Hochdeutsch und Plattdeutsch*, 1858.

**Grotius,** or **de Groot,** HUGO, 1583–1645. Dutch jurist and theologian, imprisoned for Arminianism 1619; escaped 1621; pensioned in France; Swedish Ambassador at Paris 1635–45; one of the first scholars of his age. *De Mari libero*, 1608. His *De jure belli et pacis*, 1623, laid the foundations of international law; his *Truth of the Christian Religion*, 1627, has been highly valued.

**Grotthuss' Hypothesis.** Advanced to explain the action of the electric current in the process of electrolysis. It supposed: (1) that the molecules arrange themselves between the two electrodes so that the negative atoms of each molecule shall be on the side toward the positive electrode; (2) that they are decomposed, the negative parts of one recombining with the positive parts of the next. Thus at the two electrodes after the first operation a sufficient quantity of the ions are set free to form one complete molecule. By a continuation of this process the whole of the electrolyte may be decomposed. This hypothesis is consistent with the laws of electrolysis discovered by Faraday.

**Grotto.** Natural or artificial cave. The taste for garden grottoes is now extinct. Pope's grotto at Twickenham is one



The Grotto of the Nativity, Bethlehem.

of the most famous examples. The celebrated Grotto of the Nativity, Bethlehem, the traditional scene of Christ's birth, was inclosed by the Empress Helena with a fine basilica which still exists.

**Grouchy,** EMMANUEL, MARQUIS DE, 1766–1847. French general, prominent in Napoleon's wars; Marshal 1814; indirect cause of the defeat at Waterloo, by too literal obedience to orders; exiled 1815–19; Peer of France 1831. Published *Fragments Historiques; Memoires*, 1873.

**Ground Cherry.** Plants with pulpy berries inclosed in an inflated calyx; of the genus *Physalis*, natural family *Solanaceæ*; of wide geographical distribution.

**Ground Hog.** See ARCTOMYS.

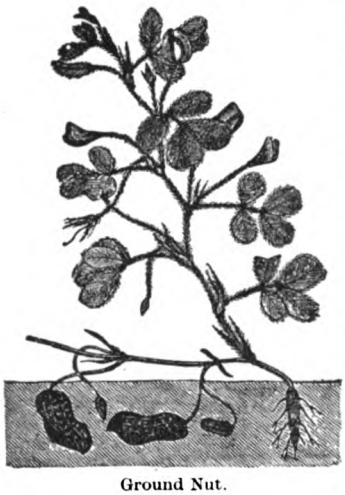
**Ground Ice.** Ice forming at the bottom of rivers, lakes, and ocean, adhering to stones, and sometimes buoyant enough to lift and carry them along; the bottom water may be below freezing point or the top water kept fluid by the wind.

**Ground Ivy.** See GILL.

**Ground Laurel.** See ARBUTUS, TRAILING.

**Ground Lever.** Short lever operating a railroad switch, and lying upon the ground when the switch is either open or closed; sometimes called a Tumbling Lever.

**Ground Nut.** 1. *Apios apiosa.* Vine of the Bean family, bearing edible tubers, native of e. N. America. 2. *Panax trifolia*, low herb of the Ginseng family, also N. American.


Ground Nut.

**Ground Pine.** *Lycopodium obscurum.* Plant of the Club-moss family, native of N. America.

**Ground Pink.** See PINK, MOSS.

**Ground Plum.** *Astragalus caryocarpus.* Herb of the natural family *Leguminosæ*, bearing large round pods, native of the n.w. U. S.

**Ground Rent.** Rent reserved to the grantor in fee of land. In Pa. it is an estate in the land remaining in the grantor; by a modern statute it cannot be irredeemable. In Ind. it is rent reserved on a long-time lease, as for 99 years. Also rent paid for building sites, the owner only reserving the right to the perpetual rent.

**Groundsel.** Plants of the genus *Senecio*, especially *S. vulgaris*, of the Composite family and of wide geographical distribution.

**Groundsel Tree.** *Baccharis halimifolia.* White-flowered shrub of the Composite family, growing in maritime districts of the e. U. S.

**Ground Tackle.** Everything belonging to a ship's anchors, and whatever is necessary for anchoring or mooring.

**Ground Water.** Subsoil water, that which is obtained from wells. The character of this water depends upon the soils and the surface drainage. A well obtains drainage from a superficial area three times its own depth.

**Group.** Some of the minor divisions of the stratified rocks. See INTERNATIONAL CONGRESS.

**Group of Equations.** Number of equations involving the same unknown elements under different conditions.

**Group Permutations.** Arrangement of elements by sets or groups containing a certain number in different order. The number of possible permutations of "n" elements taken "m" at a time equals the product of the numbers from "n," decreasing by unity, to the number one greater than the difference between n and m.

**Grouse.** See TETRAONIDÆ. Twenty-four species are known. The Ptarmigan (*Lagopus*) is exceptional in changing its plumage to snow-white on the approach of winter. *Cupidonia* is the PRAIRIE CHICKEN (q.v.). *Centrocercus*, the Sagecock, may attain a weight of 6 lbs. It lives on the western desert plains of the U. S., makes a hollow sound by means of inflated sacks on the sides of its neck, and has no gizzard. *Tetrao urogallus*, the Capercaille of n. Eur-Asia, may exceed 12 lbs.; breeding takes place in March, and the males at the time appear to be under a series of spells. The Ruffed Grouse (*Bonase*) is exceptional in having its legs bare of feathers; it has special tufts on the sides of the neck. The males at various seasons perform a drumming by means of rapid up and down motions of the wings. See also SAND GROUSE.

Ptarmigan in summer.

Ptarmigan in winter.

**Grout.** Mortar having an excess of water, so that it can be poured into cracks and openings between the stones of masonry.

**Grove,** SIR GEORGE, b. 1820. English writer on music; baronet 1882; ed. *Dict. of Music and Musicians*, 1879–89; collaborator on Smith's *Dict. of the Bible.* Director Royal Coll. of Music in London since 1882; author of many valuable symphonic analyses.

**Grove,** SIR WILLIAM ROBERT, F.R.S., b. 1811. English judge (1871) and physicist, knighted 1872. *Correlation of Physical Forces*, 1846; *Continuity of Phenomena*, 1866.

**Groveton** [AND GAINESVILLE], BATTLE OF. In Va., Aug. 28 and 29, 1862; loss on each side ab. 7,000.

**Grow,** GALUSHA AARON, b. 1824. M. C. from Pa. 1851–63 and 1895; Speaker 1861–63.

**Growing Pains.** Dull painful sensations often experienced by young persons in the limbs, and probably due to congestion of the tissues which are increasing in size, etc.

**Growing Point.** Parenchyma cells which are constantly forming in a growing root immediately behind the root-cap.

**Grub.** Larva of insects, especially of beetles. They attack the roots of plants, different species being destructive to different kinds of plants.

**Grubbing.** Operation of clearing away trees and stumps from a surface which is to be excavated.

**Gruber,** JOHANN GOTTFRIED. 1774–1851. Prof. Wittenberg 1811, Halle 1815; biographer of Wieland, 1815, and Klopstock, 1832; ed. *Allgemeine Encyklopädie*, A—G, begun 1818.

**Grub Street.** Near Moorfields, London; now Milton Street. In it lived, ab. 1660–1770, many literary hacks, derided by Marvell, Swift, and especially Pope.

**Grummet.** Piece of rope laid into a circular form and used instead of a rowlock for a large boat, also for other purposes.

**Grundtvig,** NICOLAI FREDERIK SEVERIN, 1783–1872. Danish poet and theologian. *Mythology*, 1808; *World's Chronicle*, 1812. His *Church's Reply*, 1825, attacked the prevalent rationalism, and caused his suspension till 1831. *Hymns*, 1837. He effectively advocated several reforms, and led a strong party.

**Grundy,** MRS. Personification of society, public opinion, or gossip; first mentioned in a play by T. Morton, 1800.

**Grundy,** FELIX, 1777–1840. Chief-justice of Ky. 1807; M.C. from Tenn. 1811–14; U. S. Senator 1829–35; U. S. Atty.-gen. 1838–39.

**Grüner,** LOUIS, 1809–1883. French geologist, chemist, and mining engineer. Prof. of Metallurgy at L'Ecole des Mines 1858–72. Wrote profusely on geology and metallurgic chemistry, and an introduction to the study of metallurgy, in 2 vols.

**Grüner,** WILHELM HEINRICH LUDWIG, 1801–1882. German-English engraver and writer on decorative art.

**Grunewald,** MATTHIAS, ab. 1460–ab. 1520. German painter of devotional and historical subjects, called the German Correggio from his similarity of style. He lived principally at Aschaffenburg and Mentz.

St. Anthony and St. Sebastian (by Grunewald), Colmar Museum.

**Gruppe,** OTTO FRIEDRICH, 1804–1876. Prof. Berlin 1844;

dramatist and poet. His *Antæus*, 1831, opposed Hegel's views. *Demetrius*, 1861.

**Gruter,** JANUS, 1560–1627. Prof. Heidelberg 1592; ed. sundry Latin authors; writer on Roman Inscriptions, 1603.

**Gruyère.** Swiss town, 16 m. s. of Freiburg, famous for a goat's-milk cheese largely produced in the district. Pop. ab. 2,000.

**Gryllidæ** (CRICKETS). Saltatorial *Orthoptera*, with thick bodies and a free head, bearing long antennæ. The anterior wings are short and do not cover the posterior pair. In the male the rubbing of the two wing-covers against each other produces the chirping sound, which is a sexual call. Fertilization takes place by aid of spermatophores.

**Gryphias,** ANDREAS, 1616–1664. German dramatist.

**Gryphite.** Beak-shaped inequivalve shell of the Oyster family, abounding in the upper Mesozoic.

**Gsellfels,** THEODOR, b. 1819. Swiss author of guide-books, mainly for Italy.

**Guaco.** *Mikania guaco.* Vine of the Composite family, native of tropical America; improbably considered a cure for snake bites.

**Guadalajara.** City of Mexico, capital of the State of Jalisco; in the Atemarac valley, nearly 5,000 ft. above the sea; founded 1531 by Guzman. Pop., 1889, 105,000.

**Guadalquivir.** River of s. Spain, heading in the Sierra Morena and flowing s.w. to the Atlantic. Length ab. 300 m.

**Guadalupe Hidalgo,** TREATY OF. Between the U. S. and Mexico, Feb. 2, 1848. The U. S. gained New Mexico and Upper California by paying $15,000,000 and assuming the payment of $3,500,000 due from Mexico to American citizens for property destroyed.

**Guadeloupe.** W. India island, one of the Lesser Antilles, s. of Antigua, discovered 1493, colonized from France 1635, held

Basse-Terre, Guadeloupe.

by it from 1816. Area 618 sq. m.; pop., 1889, 165,889, 85 per cent natives.

**Guadiana.** River of Spain, heading in the mountains e. and s. of Toledo, flowing w. and then s. to the Atlantic. Length 511 m.; drainage area 23,322 sq. m.

**Guaiacol.** $C_6H_4{:}(OH)OCH_3$. Monomethyl pyrocatechin; liquid of empyreumatic odor, present in wood tar; source for pyrocatechin, which is prepared from it by the removal of the methyl group with hydriodic acid.

**Guaira,** LA. Port of Caracas, Venezuela, with harbor of 90 acres, depth at quays 10–40 ft. Pop., 1890, 14,000.

**Guanaco.** Wild form of the Llama of the Andes. It attains a length of 8 ft. and height of 4 ft. at the shoulder. In structure it is like the camel, but has no hump. It occurs in flocks of many females, guided by a male. They breed in Sept., the calf is born in 11 months, and suckled 4 months. The color is dirty brown. The ears are very large, the hearing acute. They defend themselves by ejecting the contents of their stomachs.

**Guanahani.** Native name of W. Indian island, first land seen by Columbus Oct. 14, 1492, and which he called San Salvador; now usually identified with Watling Island.

**Guanajuato.** See GUANAXUATO.

**Guanare.** Capital of Zamora State, Venezuela, 225 m. s.w. of Caracas. Pop. 10,900.

**Guanaxuato,** or GUANAJUATO. City of Mexico, in a narrow gorge and on mountain sides, in a rich silver mining district. It has a mint and textile industries. Elevation 6,663 ft.; pop., 1889, 73,531.

**Guanches.** Original natives of the Canary Islands, probably of Berber stock, conquered by the Spaniards 1477.

**Guanine.** $C_5H_5N_5O$. White, amorphous, insoluble powder, occurring in the pancreas, and in guano, from which it is obtained; converted by nitrous acid into xanthine.

**Guano.** A mixture of earthy phosphates and other mineral compounds, resulting from the slow alteration of excrements and remains of birds that have accumulated on islands off the w. coast of S. America and Africa. It was one of the

Guano Bed, West Coast of Australia.

earliest forms of commercial fertilizer used, and formerly was of much better quality than at present, especially in regard to nitrogen, containing up to 16 per cent of ammonia in combination. It is now comparatively little used.

**Guapore.** Large S. American river, tributary of the Mamore, forming part of the frontier between Bolivia and Brazil.

**Guara.** Wild dog of S. America, somewhat resembling a hyena. It lives and hunts solitarily, not in packs, has a peculiar cry, and grows to a length of 5 ft. The tail is fox-like.

**Guarana.** *Paullinia sorbilis.* Vine of the natural family *Sapindaceæ*, native of Brazil. The fruit furnishes a mealy substance, used by the natives as the basis of a stimulating beverage.

**Guaranty.** Contract by which A becomes bound to B for the liability of a third person. The Statute of Frauds requires it to be in writing. It may be absolute or conditional, for one transaction or for all dealings during a specified period.

**Guard.** Fibrous skeleton of a Belemnite in which is lodged the phragmacone.

**Guardafui,** CAPE. Extreme e. point of Africa at the mouth of the Red Sea, 11° 50′ N., 51° 26′ E.

**Guard Cells.** Two cells which compose the outer portion of the stomata or breathing pores of plants.

**Guardi,** FRANCESCO, 1712–1793. Venetian painter. His subjects, mainly views in Venice, rank well.

**Guardian.** Person appointed by or according to law to care for the person or property, or both, of one whom the law treats as incapable of caring for himself. At present they are generally appointed by will or by courts, required to give bonds for the faithful performance of their duties, and held to strict accountability by the courts.

**Guardian.** English periodical, consisting of essays contributed chiefly by Addison and Steele, 1713.

**Guard Rails.** Laid near the main rails of a railroad track upon a bridge so as to prevent lateral movement of the train in case of a derailment. They may be either of iron or of timber.

**Guarini,** GIOVANNI BATTISTA, 1537–1612. Italian poet, prof. at Ferrara 1557. His chief work, *Il Pastor Fido*, a tragicomic pastoral, was produced 1585, and extensively translated.

**Guarino,** 1370–1460. Italian scholar, who studied at Constantinople and assisted in the revival of classical learning. He prepared grammars and translations, and acted as interpreter at the councils of Ferrara and Florence.

**Guarino,** or **Varinus,** called FAVORINUS or CAMERS, 1450–1537. Italian Benedictine, compiler of the *Etymologicum Magnum*, an extensive treasury of the Greek language.

**Guarnerius.** Family of violin makers at Cremona. The most famous was GIUSEPPE ANTONIO, 1683–1745, also called del Gesù, because of the symbol I.H.S. frequently found on his instruments.—His uncle, ANDREA, whose instruments were made from 1650 to 1695, was a pupil of Niccolo Amati.—His sons, GIUSEPPE and PIETRO, produced violins 1690–1730.

**Guatemala.** Republic of Central America. The great plateau of Mexico extends s. with diminishing height into it, comprising nearly all of its area, and is capped by numerous mountain ranges and volcanic peaks. The soil is fertile, producing tropic fruits, vegetables, and grains. The area is ab.

Guatemala—The Ancient City.

46,600 sq. m. It was a Spanish viceroyalty till 1820, confederated with other states 1824–39, ruled by Carrera 1851–65, and by Barrios 1873–85. Pop. ab. 1,500,000. The capital, Guatemala la Nueva, is 72 m. from the Pacific, at an elevation of 4,932 ft. Pop., 1891, 70,000.

**Guatemozin,** ab.1495–1525. Nephew of Montezuma; last of the Aztec rulers of Mexico. He came to the throne during the invasion of Cortes, by whom he was taken captive, tortured, and executed on a charge of conspiracy.

**Guava.** *Psidium pomiferum* and *P. pyriferum.* Small trees of Myrtle family, natives of tropical America, widely cultivated for their edible fruits, which are made into Guava Jelly.

**Guaviare.** River of Colombia, 450 m. long, tributary to the Orinoco.

**Guazzo.** Hard and durable painting in distemper used by the ancients, the vehicle being egg, gum, or glue, which successfully resists damp and preserves brilliancy.

**Guayaquil.** Seaport of Equador, at the head of the Gulf of Guayaquil. Pop., 1890, 44,772.

**Guayaquil,** GULF OF. Arm of the Pacific extending into Ecuador: lat. 2–3° S.

**Guaymas.** Seaport of w. Mexico, on Gulf of California; terminus of the Sonora R. R. Pop. ab. 7,000.

**Gubbio.** Italian town, in the Apennines; once populous; noted for its ancient remains. Pop. ab. 5,550.

**Guben.** Manufacturing town of Brandenburg, Prussia, 28 m. s. of Frankfurt. Pop., 1890, 28,800.

**Gubernaculum.** Sac which surrounds the generative products inside the gonangium of hydroids, and serves to direct them to the orifice.

**Gubernatis,** ANGELO, COUNT DE, b. 1840. Prof. Florence 1863; voluminous writer in several fields, especially the oriental, antiquarian, and biographic. *Dict Contemporary Authors,* 1879–80; *Hist. Universal Literature,* 15 vols., 1882–85.

**Gude,** HANS FREDERIK, b. 1825. Norwegian landscape-painter, prof. Düsseldorf 1854, Berlin 1880.

**Gudgeon.** An iron bearing fixed upon the end of the wooden shaft of a water-wheel.

**Gudum.** German epic, ab. 1200.

**Guebers,** or GEBIRS. Followers of Zoroaster, fire-worshipers, or Parsees; found chiefly in w. India, where they emi-

Guebers.

grated on the conquest of Persia by the Arabs 720; estimated ab. 82,000; a remnant are in Persia.

**Guelder Rose.** See SNOWBALL TREE.

**Guelph.** Family name of the reigning house of Great Britain; descended from Guelph, Duke of Corinthia in Bavaria, through Henry the Lion, who retained his allodial estates, Brunswick-Lüneburg, at the dissolution of Saxony 1180. These estates were reunited in George Lewis of Hanover (son of Ernest Augustus and Sophia, granddaughter of James I.) and his wife Sophia Dorothea, and passed with him to the English crown.

**Guelph and Ghibelline.** Papal and imperial factions of Italy ab. 1140–1400. The origin of the name is ascribed to the contest for the imperial crown between Conrad of Hohenstaufen, Duke of Swabia, Lord of Wiblingen (hence Ghibelin), and Henry, nephew of Welf or Guelf, Duke of Bavaria (1138). The former was successful, but the Pope and several Italian cities favored his rival.

**Guelphs,** ORDER OF. Founded 1815 by George IV. of England, as Regent of Hanover; bestowed on some British subjects.

**Guemes y Horcasitas,** JUAN FRANCISCO, 1682–1768. Spanish Gov. of Cuba 1734–46; Viceroy of Mexico 1746–55; Count of Revillagigedo 1755.—His son, JUAN VICENTE, 1740–1799, was Viceroy of Mexico 1789–94, and a beneficent ruler.

**Guercino,** GIAN FRANCESCO BARBIERI, 1590–1666. Italian painter of the School of Bologna. In the Villa Ludovisi at Rome is his fresco of *Aurora,* in the Brera Gallery of Milan his *Expulsion of Hagar.* He ranks nearly with Guido and Domenichino.

St. Petronilla (by Guercino), Capitol Gallery, Rome.

**Guericke,** HEINRICH ERNST FERDINAND, D.D., Ph.D., 1803–1878. Lutheran theologian, prof. at Halle 1829–35 and from 1840. *Life of A. H. Francke,* 1827, tr. 1837; *Ch. History,* 1833, tr. 1860–70; *Ch. Antiquities,* 1847, tr. 1851.

**Guericke,** OTTO VON, 1602–1686. German writer on physics; inventor of the air-pump 1650, and the Magdeburg hemispheres.

**Guerillas.** Irregular fighters, gathered for ambuscades, raids, etc.; so called first in Spain 1808.

**Guérin,** GEORGES MAURICE DE, 1810–1839. French poet of posthumous fame. *Remains,* 2 vols., 1860.—His sister, EUGENIE, 1805–1848, left *Journals and Letters,* 1861–64, tr. 1865.

**Guérin,** PIERRE NARCISSE, 1774–1833. French painter, made baron 1829. His subjects were classical, historic, and portraits.

**Guernsey.** Island in English Channel, n.w. of Jersey. Area ab. 28 sq. m.; pop., 1891, 37,754. See CATTLE.

**Guéroult,** ADOLPHE, 1810–1872. French journalist and publicist; Deputy 1863–69.

**Guerrazzi,** FRANCESCO DOMENICO, 1804–1873. Italian patriot and political novelist, exiled 1834; dictator of Tuscany 1850, imprisoned 1854–57, then banished; afterward in the Tuscan and Italian Parliaments. *Battle of Benevento,* 1827; *Siege of Florence,* 1836; *Isabella Orsini,* 1844; *Beatrice Cenci,* 1854.

**Guerrero,** VICENTE, 1783–1831. Mexican general, active against Spain, Iturbide, and Pedrazza; Vice-Pres. 1824–28, Pres. 1829–30; executed.

**Guesclin,** BERTRAND DU, ab.1314–1380. Ablest French general of his time; Constable 1369; active chiefly against the English, whom he almost wholly expelled.

**Guess,** GEORGE, or **Sequoyah,** ab.1770–1843. Inventor of the Cherokee alphabet 1826.

**Guest.** One accepted by an innkeeper as entitled to transient accommodation; distinguished on one hand from the caller or visitor, on the other from the boarder.

**Guest,** EDWIN, LL.D., F.R.S., 1800–1880. English antiquarian. *Origines Celticæ,* 1883.

**Guest,** JOHN, U.S.N., 1821–1879. Captain 1866, Commodore 1873; prominent in the attack on Vicksburg and opening of the lower Mississippi 1862.

**Gueux,** or "BEGGARS." Dutch patriots, who under Margaret of Parma, 1565–6, began to oppose the tyranny of Philip II.; mostly executed, exiled, slain in battle, or won over; more

successful as BEGGARS OF THE SEA (q.v.) in capturing Spanish vessels and preparing the way for national independence.

**Guevara,** ANTONIO DE, ab. 1490–1545. Spanish author; Bp. of Guadix and of Mondoñedo; initiator of Euphenism. *Marcus Aurelius*, 1529; *Golden Epistles*, 1539, tr. 1574.

**Guevara,** LUIS VELAZ DE, ab. 1571–1644. Spanish playwright and novelist. His *Diablo Cojuelo* was the basis of Le Sage's *Diable Boiteux*.

**Guglielmi,** PIETRO, 1727–1804. Italian composer of operas long popular; Chapelmaster at Rome 1793.

**Guiana.** Region on n. coast of S. America, long. ab. 52–60° W.; first seen by Europeans 1499, and long fought over.

**Guiana,** BRITISH. Settled by the Dutch ab. 1610; held by England since 1803. The country is low and flat near the Atlantic seaboard, rising inland to tablelands and mountains, which separate it from Brazil. Area variously estimated at 76,000 and 109,000 sq. m. Pop., 1891, 288.328. The capital is Georgetown. A long-standing dispute with Venezuela as to the w. boundary excited great commotion in the U. S. 1895–6.

Kaieteur Falls, British Guiana.

**Guiana,** DUTCH. Settled 1652; held by England 1799–1802 and 1804–16. The country is low and flat near the coast, rising into plateaus and mountains in the interior. Area 461,-060 sq. m.; pop. ab. 80,-000, one-third savages or bush negroes. The capital is Paramaribo.

**Guiana,** FRENCH. Between Dutch G. and Brazil; colonized 1604–34 and 1763; twice held by the Dutch and twice by the British; formerly a penal settlement. Area 46,850 sq. m.; pop., 1890, 25,796. Capital, Cayenne.

**Guiana Bark.** Bark of *Portlandia hexandra*, native of Guiana, having corymbs of large purple flowers, used as a febrifuge.

**Guicciardini,** FRANCESCO, 1483–1540. Prof. at Florence 1505; Gov. of Modena 1518, and of Bologna 1531–34. His *History of Italy*, 1490–1534, pub. 1561–64, tr. 1579, retains a high rank.

**Guicowar.** Designation of the Indian feudatory chieftain of Baroda; it means cowherd. The family are of the cowherd race of the great Mahratta confederacy to whose supremacy the British succeeded 1802.

**Guide Pulleys.** Small belt wheels or pulleys for carrying a driving belt or rope round a corner or giving it a direction which it would not take if left to its own tension. They may or may not be flanged for flat belt, but it is better to have the flange stationary. For round rope they are grooved, the radius of the groove being greater than that of the rope. They are conveniently mounted on a mule frame, which admits of their axis being easily inclined to right angles with the plane through the two bights of the belt or rope.

**Guides.** Portions of the timbering in a mine shaft, or special wire cables, arranged to keep the cage or other form of hoisting carriage steady during the hoisting.

**Guidi,** CARLO ALESSANDRO, 1650–1712. Italian lyric poet and dramatist.

**Guido d'Arezzo,** or **Aretinus,** ab. 990–ab. 1070. Benedictine monk, long credited with many inventions in music. He undoubtedly began the movement which introduced the lines of the staff; and the use of the syllables, Ut (Do), re, mi, etc., to indicate the intervals of the diatonic scale is traced back to a mnemonic verse from a hymn to St. John which he taught his pupils to sing:

Ut queant laxis
Resonare fibris,
Mira gestorum
Famuli tuorum
Solve polluti
Labii reatum
Sancte Joannes.

**Guido Reni,** 1575–1642. Bolognese painter; leading artist of his school, but not distinguished for intellectual qualities.

Guido's Aurora (Rospigliosi Palace, Rome).

His greatest work is the *Aurora* fresco of the Rospigliosi Palace at Rome. The portrait of Beatrice Cenci (so called) in the Barberini Palace is widely known. His Ecce Homos, Magdalens, etc., are known in numerous replicas.

**Guienne.** Largest of the ancient French provinces, called Aquitania. It was situated in the s.w. Bordeaux was the capital and Gascony a dependency: it included the present departments between the Dordogne and Pyrenees. See AQUITAINE.

**Guignes,** JOSEPH DE, 1721–1800. Prof. Coll. of France 1757; orientalist. *Hist. des Huns, Turcs, Mogols*, 1756–58.—His son, CHRÉTIEN LOUIS JOSEPH, 1759–1845, edited a Chinese dictionary, 1813.

**Guignet's Green.** $Cr_2O_3.2H_2O$. Green powder, used as a pigment; made by heating potassium dichromate with 3 parts boric acid and washing the residue.

**Guigniaut,** JOSEPH DANIEL, 1794–1876. Prof. Paris. *Religions de l'Antiquité*, 10 vols., 1825–51.

**Guild,** REUBEN ALDRIDGE, LL.D., b. 1822. Librarian of Brown Univ. 1848–93, and its historian 1867.

**Guildhall.** Town-hall of London: built 1411; burned 1666; rebuilt 1669 and 1789.

**Guilds,** or GILDS. Organizations of merchants, handicraftsmen, or others, formed to support one another, control the industry in which they were engaged, or exert corporate strength in arrangements with lords or with other similar bodies. The earliest were the religious and frith guilds; those of greatest influence and extent were of the later merchants and crafts.

**Guilford Court House,** BATTLE OF. Near Greensborough, N.C., March 15, 1781. The Americans under Greene were defeated by the British under Cornwallis.

**Guillaume,** JEAN BAPTISTE CLAUDE EUGÈNE, b. 1822. French sculptor.

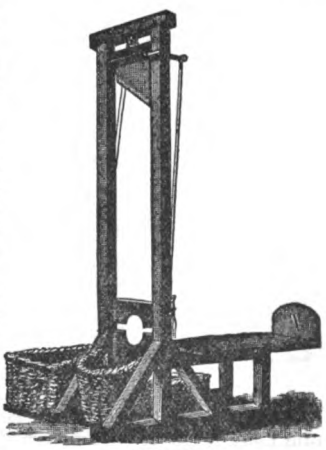
**Guillaumet,** GUSTAVE ACHILLE, 1840–1887. French painter.

**Guillemet,** JEAN BAPTISTE ANTOINE, b. 1842. French landscape-painter.

**Guillemin,** AMADÉE VICTOR, 1826–1892. Prof. Paris; popular writer on astronomy and physics. *The Heavens*, 1866; *The Sun*, 1869; *Forces of Nature*, 1872; *Comets*, 1876.

**Guilloche.** Ornamental design formed of undulating lines of parallel contours.

**Guillotine.** Instrument for decapitation by a falling steel blade; much employed during French Revolution; improvement on a contrivance used in the 16th century, and in Italy much earlier.



Guillotine.

**Guilmant,** FÉLIX ALEXANDRE, b. 1837. French organist and composer; known in the U. S. 1893.

**Guilt.** Violation of positive human, or of abstract moral laws.

**Guimares.** Town of Portugal, 25 m. n.e. of Oporto. Noted for its architectural monuments and beautiful surroundings. Nearby are warm springs, much used for bathing. Pop. ab. 7,700.

**Guinea.** English gold coin minted 1664–1817; displaced by the sovereign or pound; still mentioned in fees and other

Spade Guinea.

charges, and rated at 21 shillings; so named from having been first coined of gold brought from Guinea.

**Guinea,** GULF OF. Part of the Atlantic, on the w. African coast n. of the equator. Its shores were known to Europeans from ab. 1350.

**Guinea Fowl.** Birds of sub-family *Numidinæ* of the *Phasianidæ*. Ab. 10 species are known. Some are crested, some have helmets, some bare heads. They are of Madagascar and Africa, go in flocks, are swift-footed, noisy, more or less spotted, and usually with richer colors than in the common Guinea hen (*Numida meleagris*).

**Guinea Pepper.** Aromatic and somewhat pungent condiment used in Europe till ab. 1800, when Eastern peppers supplanted it. It is made from the berries of *Capsicum frutescens*.

**Guinea Pig.** Native of S. America; probably named from Guiana; now much used in bacteriological laboratories for testing inoculations of disease germs. See HYSTRICOMORPHA and CAVIES.

**Guinea Worm.** See FILARIDÆ.

**Guinegate.** See SPURS, BATTLE OF.

**Guinevere.** Wife of King Arthur of the Round Table, in love with Sir Launcelot, famous in legend; celebrated in Tennyson's *Idyls*.

**Guinicelli,** GUIDO, d. 1276. Italian poet.

**Guinness,** SIR BENJAMIN LEE, 1798–1868. Irish brewer; M. P. 1865, Baronet 1867; notable for benefactions; as is his son, SIR EDWARD CECIL, b. 1847.

**Guiraud,** ERNEST, 1837–1892. American-French composer, chiefly of operas.

**Guiscard,** ROBERT, ab. 1015–1085. Norman, prominent in Italian and Greek wars; Duke of Apulia and Calabria 1059. With his brother, ROGER, 1031–1101, he drove the Saracens from Sicily and founded the kingdom of Naples.

**Guise.** Family prominent and mischievous in French history, as dukes or cardinals. The first duke (1527) was CLAUDE of Lorraine, 1496–1550; his daughter married James V. of Scotland.—His sons, FRANCIS, 1519–1563, 2d duke, and CHARLES, Cardinal, 1524–1574, helped by their niece, Mary Stuart, wife of Francis II., gained immense power, and used it to persecute, the Huguenots.—HENRY, "Le Balafré," 1550–1588, 3d duke,

Death of the Duke of Guise (by Delaroche).

headed the Massacre of St. Bartholomew, 1572, and the Catholic League, 1576, became greater than the King, and so endangered the throne that Henry III. had him murdered, as also his brother, LOUIS, 1555–1588, Abp. and Cardinal.—CHARLES, 1571–1640, 4th duke, Prince de Joinville, was banished 1631.—HENRY, 1614–1664, 5th duke, had a checkered career in France, Italy, and Spain. All were bold, ambitious, and unscrupulous. The 7th duke d. 1675.

**Guitar.** Musical instrument of the lute family, the strings of which are plucked by the fingers of the right hand and stopped by those of the left on a finger-board provided with frets. It is supposed to have been introduced into Spain by the Moors, and is most popular in Southern countries.

**Guiteau,** CHARLES JULES, 1841–1882. French-Canadian lawyer, resident of Chicago; assassin of PRES. GARFIELD (q.v.), July 2, 1881; tried for the crime, condemned May 22, 1882, and executed June 30.

**Guittone D'Arrezzo,** ab.1225–ab.1294. Italian poet.

**Guizot,** FRANÇOIS PIERRE GUILLAUME, 1787–1874. French Protestant; State Councilor 1817; lecturer at the Sorbonne 1820; Deputy 1830; Minister of the Interior 1830, of Public Instruction 1832–36, of Foreign Affairs 1840–47; Academician 1836; Envoy to England 1840; Prime Minister 1847. His services to the state were eminent, but not greater than to historical literature, wherein he displayed great industry. His works are numerous, solid, and mostly familiar in English translations: prominent among them are *Civilization in Europe*, 1828, and *in France*, 1830; *Memoirs of My Own Time*, 1858–68; and *Hist. France*, 5 vols., 1870–75.

**Gujranwala.** Town in the Punjab, India, 42 m. n.w. of Lahore, birthplace of Ranjet Singh, founder of the Sikh Kingdom. Pop., 1891, 26,800, principally Moslems.

**Gula.** Upper part of throat of birds; also piece which carries the second maxilla in insects.

**Gules.** Red, when referred to as a tincture in Heraldry, indicated on the shield by close vertical lines.

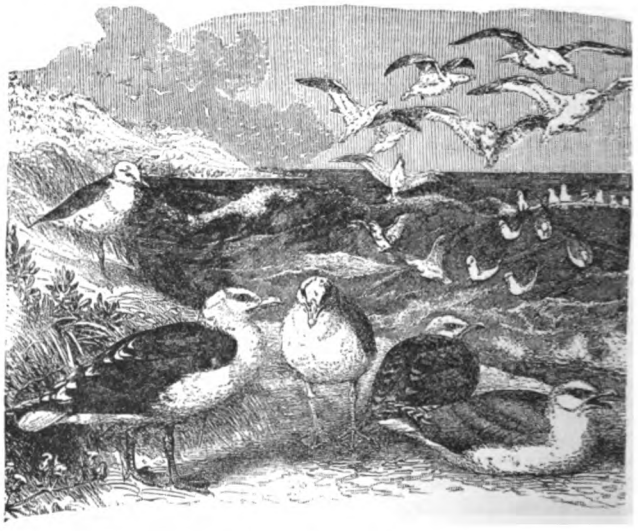
**Gulf Stream.** Oceanic current of the N. Atlantic. Appearing off Fla., it flows n. e., near the U. S. coast, gradually bends to the e., and flows with a diminishing velocity to the coast of Europe. Its extreme velocity is 5 m. an hour in the Strait of Florida, 50 m. wide; off Cape Hatteras 3 m. an hour, 150 m. wide; off Sandy Hook 300 m. wide; on banks of Newfoundland 1½ m. an hour.

**Gulfweed.** *Sargassum bacciferum*. Olive green alga, found floating abundantly in the Gulf Stream, and in vast quantities in the s. central Atlantic Ocean, where it covers an area of some 200,000 sq. m. to a thickness of several feet, forming the Sargasso Sea.

**Gull,** SIR WILLIAM WITHEY, M.D., 1816–1890. Prof. Royal Inst. 1847–49; long lecturer at Guy's Hospital; Baronet 1871; professional writer. *Alcohol*, 1878.

**Gulliver,** LEMUEL. Hero of Swift's satirical romance 1726. His voyages were to Lilliput, Brobdingnag, Laputa, and the Houyhnhnm country.

**Gulls.** Birds of family *Laridæ*, in color white to pearl gray, with dark upper parts; those with black heads lose this



Carrion and Silver Gull.

color in winter. The feet and bills are red or yellow, the sexes alike, but the young are more dusky than the adults. They are water fowl, mostly marine. The Mackerel Gull has the

habit of robbing the Oyster Catcher (*Hæmatopus*) of the food secured. Ross's Gull breeds in the unknown regions about the North Pole, and was very scarce in collections till 1882, when U. S. National Museum received a large number. This bird has red feet, black bill, and a narrow black collar.

**Gully,** WILLIAM COURT, b. 1835. Q.C. 1877, M.P. 1886, Speaker 1895.

**Gum.** Secretions or exudations from plants which are soluble or swell up in water.

**Gum Arabic.** Gum derived from several small spiny trees of the genus *Acacia*, natural family *Leguminosæ*, natives of w. Asia and Africa.

**Gum Boil.** Swelling and inflammation, usually terminating in suppuration, of the gum; caused by decay of a tooth.

**Gummere,** FRANCIS BARTON, Ph.D., b. 1856. Prof. Haverford Coll. 1887. *Germanic Origins*, 1891.

**Gummy Tumor,** or GUMMA. Swelling of a cream yellow color within, and doughy or horny in consistence, observed in tertiary syphilis in various parts of the body, and varying in size from that of a millet seed to that of a walnut. They disappear under appropriate treatment but if neglected may give rise to trouble by pressure upon surrounding parts.

**Gums.** Amorphous carbohydrates, usually of vegetable origin, insoluble in alcohol. Treated with water they either dissolve or swell up, forming a starchy mucilaginous substance.

**Gums.** The dense fibrous pink tissue which covers the bony (alveolar) margins of the two jaws, and incloses the neck of the teeth; protects and helps to nourish the teeth.

**Gum Tragacanth.** Gum derived from *Astragalus gummifer*, a low, spiny shrub of the natural order *Leguminosæ*, native of w. Asia.

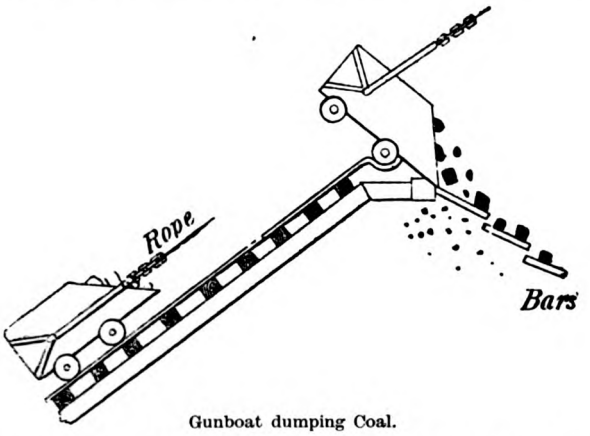
**Gum Tree,** BLUE. See EUCALYPTUS.

**Gum Tree,** SOUR. See PEPPERIDGE.

**Gum Tree,** SWEET. See BILSTED.

**Gunboat.** Small boat armed with one or more guns of heavy caliber. Used to enter shallow harbors or to go up small streams. In 1890 the largest in England were of 735 tons; in U. S. up to 1,200 tons.

**Gunboat.** Self-dumping car, used in Pa. for raising coal on slopes. It resembles a skip, but runs on wheels instead of




Gunboat dumping Coal.

between guides. It is open at one end only, built usually of boiler iron, and has a capacity when loaded even of ab. 4 tons.

**Gun Cotton.** PYROXYLIN. Explosive compound, formed by immersing pure dry cotton in a mixture of strong nitric and sulphuric acids; discovered by Schonbein 1845; it is a substitution product the group ($NO_2$) replacing hydrogen in cellulose. $C_6H_{10}O_5+3HNO_3=C_6H_7(NO_2)_3O_5+3H_2O$. The product here is trinitrocellulose, but the degree of nitration admits of variation. Lower nitration affords a product soluble in a mixture of alcohol, forming COLLODION (q.v.) used in photography and surgery. It is insoluble in water, but soluble in acetone, and in a mixture of ether and ammonia. Its density, when in flocks or fiber, varies from 0.1 to 0.3; when compressed 1.1 to 1.5. Wet gun cotton can be compressed beyond 13,000 lbs. per sq. inch without causing explosion. When dry and loose, it burns with a flash without explosion. Its point of explosion is ab. 182° C. It is the safest explosive known, if attention be paid to directions for handling and storing: 829 volumes of gun cotton of density 1. expand to 12,064 volumes of gas, when the temperature of the gas is 3,700° C., giving a pressure of 81 tons per sq. inch. The value of gun cotton as a military explosive was much enhanced by the discovery made 1868 by E. O. Brown of Woolwich, that it could be detonated even when unconfined, by means of a small charge of mercury fulminate, and even when wet, if a small initial charge of dry gun cotton be detonated in contact with it. This is the method now used. It is estimated that gun cotton of 1.1 density when in contact exerts a pressure upon explosion of ab. 160 tons per sq. in., or ab. half that of mercury fulminate. Its combustion rate of propagation is said to be between 5,000 and 6,000 meters per second. See NITRO-CELLULOSE.

**Gun Factories.** Establishments where cannon of all calibers are manufactured, as distinguished from armories, where small-arms are made. The U. S. has one at West Troy, N.Y., for the army, and one at Washington, D.C., for the navy. That of England is at Woolwich, of Germany at Essen, of Russia at Oberkoff. Other nations purchase. A gun factory comprises an assembly of large boring and turning lathes and rifling machines, with smaller machines of the same class for making

Gun Factory, Bethlehem Iron Co., Pa.

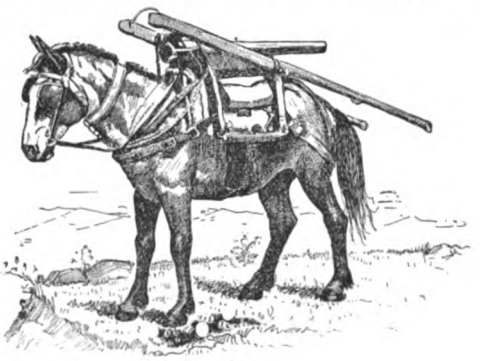
the smaller parts of the gun; large traveling cranes, with a carrying capacity up to 120 tons for the 16-inch guns; measuring rooms, where all the work is accurately gauged and inspected; heating furnaces for expanding the parts; a shrinking pit, and an assembling pit. The army gun factory has a plant capable of building the 16-inch gun, but the largest gun yet built is the 12-inch 52-ton steel gun; at the navy factory the largest is the 13-inch 63-ton gun.

**Gungl,** JOSEF, 1810–1889. Hungarian bandmaster, conductor, and composer of dance music.

**Gun Lift.** Apparatus devised by Col. T. T. S. Laidley, U.S.A. (1822–1886), to mount the 15-inch smooth-bore and other heavy guns upon their carriages with the assistance of a small detachment of men: it consists of a hydraulic jack and suitable framework. More recently, the hydraulic elevator operated by steam power to raise the heaviest modern high-powered guns from their screened position behind the parapet to their firing position en barbette. At Fort Hancock, Sandy Hook, N. Y., two of these are now constructed.

**Gun Metal.** Formerly an alloy of 90 parts copper and 10 parts tin, often called bronze or brass. The old 6 and 12-pounder field-guns and the howitzers were made of this alloy. Later, a fine quality of cast-iron, obtained by special treatment and used for casting the 8, 10, 15, and 20-inch Rodman smooth-bore guns. Now, low steel, containing ab. 0.5 per cent of carbon.

**Gun Mule.** Pack-mule for transporting light guns into any position infantry may have to occupy, particularly in



Gun Mule.

mountain warfare. The gun is ab. 46 in. long with bore 1.65 in. diameter and weighs ab. 120 lbs.

**Gunner's Quadrant.** Instrument to give the elevation of any gun or mortar, or to verify the angle obtained by the ordinary sights; invented by Tartaglia, an Italian mathematician in the 16th century. It is composed of two main parts, the body, on which is the graduated arc from 0° to 90°, and the movable arm, carrying the level and index, on which the minutes of the elevation are read. The quadrant is applied to the breech of the gun, to the face of the muzzle, or to any element of the bore or exterior surface, parallel to the axis of the bore, as may be most convenient.

**Gunnery.** Branch of the military art and science relating to the theory and practice of firing projectiles. Its principal theoretical divisions are: interior ballistics, concerning the motion of the projectile in the bore of the gun; exterior ballistics, or the circumstances of the projectile's motion from the instant it leaves the muzzle; and the determination of the projectile properties of gunpowder and explosives generally. Practically, gunnery deals with the rules for properly laying the gun, and with the effects of air pressure and wind in causing deviations. In 1887, at Shoeburgness, Eng., a shot was fired from a 9.2 in. wire gun, at 40° elevation, that attained a height of 17,110 ft. and a range of 20,236 yds. in 63.8 seconds.

**Gunnison.** Town on the Gunnison R , Col., 132 m. s.w. of Denver. Capital of G. co. Its principal industries are gold, silver, iron, and coal mining. Pop., 1890, 1,105.

**Gunnison.** Colorado river, tributary to the Grand; it runs through several deep cañons.

**Gunny Bags.** Made of jute and used for packing for exportation rice, coffee, sugar, etc., in India, and cotton in the U. S.

**Gun Pendulum.** Device, now obsolete, to prove powder; gun mounted as a pendulum, so that the axis of its bore and that of suspension have the relation of an axis of percussion and a spontaneous axis. When the gun is fired, the extent of its arc of swing with the mass of the gun and charge gives the data from which the initial velocity of the projectile can be found.

**Gun Platform.** Substructure on which the gun-carriage rests. For field pieces in garrison and siege pieces in position, the platform consists of strong thick planks in close contact, resting on heavy subsill pieces securely fastened. For the heavier seacoast artillery the platforms are built of solid masses of concrete and masonry, sufficiently durable to withstand the powerful shocks to which modern guns are subjected.

**Gunpowder.** Mixture of saltpeter, charcoal, and sulphur, forming an explosive agent to fire projectiles from guns. While the Moors or Saracens are usually credited with its first application to military purposes, its properties as an explosive agent were not generally known to European nations until early in the 14th century. In the early gunpowders the ingredients were mixed together in about equal proportions, giving a weak powder. As the art of gun making improved, the relative proportion of saltpeter was gradually increased, and the explosive qualities thus greatly improved. The usual proportions are now by weight, 75 parts of saltpeter, 15 of charcoal, and 10 of sulphur. The objects sought to be attained in its manufacture are maximum propelling force, coupled with minimum initial pressure in the bore, uniformity of action, capability to bear transportation with safety, and storage without deterioration. To secure the first, particular attention is paid to the size, shape and density of the grains, and special powders are devised for guns of various calibers. The fine-grained powders, varying from 0.03 to 0.06 inch in diameter, giving a rapid evolution of gas, are used for small arms; special powders of larger grain, as mammoth, pebble, cubical, hexagonal and perforated prismatic, by which the rate of combustion can be regulated in accordance with the desired stresses, are used for cannon. To secure uniformity of action the ingredients should be pure, finely divided, and intimately intermixed. Brown or Cocoa powder is a mixture of 79 parts potassium nitrate, 3 of sulphur, and 18 of carbon, the last being lightly baked brown charcoal. It is formed as hexagonal prism with round central hole, first used in Germany 1882. Used by U. S. Government in B. L. guns of large caliber.

**Gunpowder,** Force of. Pressure per unit of surface exerted by the gases from unit weight of powder, the gases occupying a unit volume at the temperature of explosion. Thus if one cubic decimeter of powder be exploded in a space of 1.57 cubic decimeters, the gases formed will occupy 1 cu. dm. and the solid products 0.57 cu. dm., and the pressure per sq. decimeter will be 291,200 kilograms or 18.49 tons per sq. in., which is the force of gunpowder.

**Gunpowder Pile-Driver.** One in which the ram is driven up from the head of the pile by the explosion of a cartridge. It is now but little used, as a steam engine is always at hand, and is generally employed to lift up the ram.

**Gunpowder Plot.** Project of Robert Catesby and other Roman Catholics to spring a mine under the Houses of Parliament, Nov. 5, 1605, and destroy King, Lords, and Commons. Guy Fawkes was detected preparing the train.

Execution of the Gunpowder Plot Criminals, London, 1605. (From an old print.)

**Gun Steel.** Low steel containing ab. 0.5 per cent of carbon, used in the manufacture of all modern guns. It is made by the open hearth process and cast into ingots, which are forged, bored, tempered in oil, and annealed to correct initial strains. The metal is comparatively soft, with an elastic limit of 23 to 25 tons and a tensile strength of 43 to 46 tons. It is made in this country at the Bethlehem Iron Works, Pa., and at the Midvale Steel Works, Newtown, Pa.

**Gunter,** Edmund, 1581–1626. Prof. Gresham Coll., London, 1619; writer on mathematics; inventor of the chain and scale.

**Gunter's Chain.** Sixty-six feet long, divided into 100 links, each 7.92 in. long. It is used by land surveyors in England and the U. S., but now to a less extent than formerly. See Chain.

**Gunter's Scale.** One containing divisions by which approximate computations in surveying and navigation may be mechanically made.

**Günther,** Johann Christian, 1695–1723. German lyric and satirical poet.

**Gurnard,** Fish of the family *Triglidæ*, of which the Sea Robin, common in the estuaries of our coast, are examples. One species of Gurnard (*Cephalacanthus volitans*) is capable of fly-

The Sapphirine Gurnard (*Trigla hirundo*).

ing a short distance, and is sometimes confused with the true flying fishes (*Exocœtus*), which are not acanthopterygian fish. The head of this gurnard is broad, the body tapers to the tail, and there are bony plates, ridge, and spines on the head. The pectorals have a narrow, stiff front part and an expanded posterior part. The gill-rakers are minute, and the dorsal-fin has four or five anterior spines. Internally the flying gurnards differ still more from the Exocœtids. See ACANTHOPTERI.

**Gurney,** JOSEPH JOHN, 1788–1847. English Quaker philanthropist and preacher, brother of Elizabeth Fry. *Prison Discipline*, 1819; *Peculiarities of Friends*, 1824; *The Sabbath*, 1831.

**Gurowski,** ADAM, COUNT, 1805–1866. Polish patriot, in the U. S. from 1849; writer in French, German, and English. *Russia as it is*, 1854; *Turkish Question*, 1854; *My Diary*, 1862–66.

**Gusset.** Angle iron riveted through both legs into a corner of a structure in order to stiffen it.—Also small piece of chain-mail used to protect the armpits where the need of free play left the plates unclosed.

**Gustavus I.** (VASA), 1496–1560. King of Sweden 1623; he established the Reformation, suppressed prevalent disorders, fostered commerce and education, created an army and a fleet, and left his realm prosperous and at peace.—II. (ADOLPHUS), 1594–1632, grandson of Vasa; King 1611; a great general and ruler; champion of Protestantism, and hero of the Thirty Years' War. With a small army he defeated Tilly at Leipzig and Würzberg 1631–2, and Wallenstein at Lützen, Nov. 16, when he was slain.—III., 1746–1792, King 1771.—IV., 1778–1837, King 1792, dethroned 1809.

**Gustavus Adolphus Association.** Founded 1832 in Germany to promote Protestant interests and assist congregations in R. C. regions.

**Gut.** See INTESTINES.

**Gutenberg,** JOHANN (GENSFLEISCH), ab. 1400–1468. Inventor of printing with movable metallic types at Strasburg ab. 1438, partner with Fust 1450–55, and then with Homery.

**Guthrie,** THOMAS, D.D., 1803–1873. Pastor in Edinburgh 1837–64; eminent preacher and philanthropist; ed. *Sunday Magazine*, 1864. *Plea for Ragged Schools*, 1847; *The City*, 1859; *Autobiography*, 1874–5.

**Guthrie,** THOMAS ANTHONY ("F. ANSTEY"), b. 1856. English humorist. *Vice Versa*, 1882; *Giant's Robe*, 1883; *Black Poodle*, 1884; *Tinted Venus*, 1885; *Fallen Idol*, 1886; *Pariah*, 1889; *Vox Populi*, 1892.

**Guthrie,** WILLIAM, 1708–1770. Scottish historical writer. His *Modern Geography*, 1770, was long popular.

**Gutierrez,** GARCIA, b. 1813. Spanish dramatist.

**Guttæ.** In Doric architecture, the disks applied to the under surface of the mutules in the frieze.

**Guttapercha.** *Dichopsis gutta.* Large tree of the natural family *Sapotaceæ*, native of Malaya. Its milky juice yields the commercial material, which is also produced from *Mimusops*

Collecting the juice.

*globosa*, a tree of the same family, native of n. S. America, and from some allied species. This is hard and somewhat elastic, and consists mainly of a hydrocarbon $(C_{10}H_{16})_n$. By the action of sulphur it is changed into a substance of high melting point, *i.e.*, vulcanized.

**Gutté.** In Heraldry, having the shield or charge covered with drops.

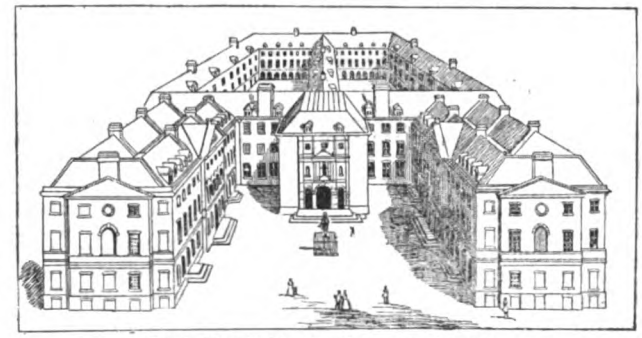
**Guttiferæ.** Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Dicotyledons*, comprising 26 genera and ab. 370 species, widely distributed in the tropics.

**Gutzkow,** KARL FERDINAND, 1811–1878. German novelist and dramatist. *Wally*, 1835; *Nero*, 1835; *Philosophy of History*, 1836; *Blasedow*, 1838; *Uriel Acosta*, 1847; *Fritz Ellrodt*, 1872.

**Gützlaff,** KARL FRIEDRICH AUGUST, 1803–1851. German missionary to China 1831. *Three Voyages*, 1834; *China Opened*, 1838.

**Guy.** Rope or rod running from the top of a derrick to an anchorage.

**Guy,** THOMAS, 1644–1724. English printer and speculator, founder of Guy's Hospital, opened 1725 in Southwark, to which



Guy's Hospital in 1750 (from an old print).

he bequeathed nearly half his fortune. It admits over 5,000 patients yearly.

**Guy of Warwick.** Hero of an English metrical romance of 13th century.

**Guyon,** JEANNE MARIE BOUVIÈRES DE LA MOTHE, 1648–1717. French mystic, opposed by Bossuet, befriended by Fénelon, and imprisoned 1688–9 and 1695–1702. *Autobiography*, 1720. Thirty-seven of her poems were tr. by Cowper 1782 and pub. 1801.

**Guyon,** RICHARD DEBAUFRE, 1813–1856. Of Huguenot descent; b. in England; in the service of Austria 1831–38, and of Turkey from 1849; general in the Hungarian revolution 1848–49.

**Guyot,** ARNOLD HENRY, LL.D., 1807–1884. Prof. of Physical Geography at Neuchâtel 1839–48, and at Princeton from 1854; author of Smithsonian Meteorological and Physical Tables. His principal work, on the Glaciers of the Alps, was done 1838 at the instance of Agassiz; by it he established the chief laws of glacier motion. His last work was a study of the Catskill Mts. Part of his collection of Alpine rocks is now at Princeton.

**Guy's Hospital.** See GUY, THOMAS.

**Guyton-Morveau,** LOUIS BERNARD, 1737–1816. Prof. of Chemistry at the École Polytechnique, Paris, director of the Mint 1800–14. With Lavoisier he pub. *Méthode de Nomenclature Chimique*, 1787, the first attempt of the kind.

**Guzerat,** or GUJRAT. Town in the Punjab, India; taken 1849 by the English under Gough, after defeating the Sikhs. Pop. ab. 20,000.—Also, a region of n. Bombay, including five British districts and sundry native states.

**Guzman,** FERNAN PEREZ DE, ab.1400–ab.1470. Spanish poet and chronicler.

**Guzman,** NUNO BELTRAN DE, ab.1485–1544. Spanish soldier, administrator of Mexico 1528–31; enemy of Cortez; conqueror of Jalisco 1530.

**Guzman,** RUY DIAZ DE, b. 1544 in Paraguay. Spanish author of *Historia Argentina*, completed 1612, pub. 1836, extending to 1575.

**Guzman Blanco,** ANTONIO, b. 1829. Vice-Pres. of Venezuela 1863–68; Pres. 1870, and long practically dictator; Envoy to France 1883–86.

**Gwalior.** Town of central India, 64 m. s. of Agra, an ancient seat of the Jain worship. It is dominated by a fortress on a rock 342 ft. above the plain. Pop., 1891, 104,100.

**Gwin,** WILLIAM MCKENDREE, M.D., 1805–1885. M. C. from Miss. 1841–43; U. S. Senator from Cal. 1850–61; imprisoned 1861–63; in France and Mexico 1863–66.

**Gwinnett,** BUTTON, ab.1732–1777. Member of Continental Congress from Ga. 1776; signer of the Declaration of Independence.

**Gwynn,** NELL, ab.1650–1690. Mistress of Charles II.; previously an orange-seller and actress; esteemed for kindness and generosity. Her son became Duke of St. Albans.

Nell Gwynn.

**Gybing.** Act of shifting a boom sail from one side of the mast to the other.

**Gyges.** King of Lydia ab. 688–654 B.C.; noted for his presents to the Delphic oracle and his magic ring, celebrated in Plato's *Republic.*

**Gyldén,** HUGO, b. 1841. Finnish astronomer, prof. Stockholm 1871.

**Gylippus.** Spartan general, who destroyed the Athenian army in Sicily 413 B.C., thus breaking the power of Athens.

**Gyllembourg-Ehrensvärd,** THOMASINE CHRISTINE (BUNTZEN), BARONESS, 1773–1856. Danish novelist. *Magic Ring,* 1828.

**Gymnasium.** Institution for physical culture. The education of the Greeks comprised grammar, music, and gymnastics, and to the latter more time and attention was given than to the others combined, gymnastics being cultivated all through life. On certain occasions distinguished pupils were selected for the exhibition of public contests, and in the gymnasia athletæ were

Exercises of the Gymnasium (Greek bowl in Munich).

originally trained, but they degenerated into resorts for idle loungers and places of amusement. Besides running, throwing the discus, leaping, wrestling, boxing, and dancing, the gymnasium games included tops, balls, tug-of-war, and knucklebones, for which separate rooms were provided. In Germany the gymnasium is a classical educational institution.

**Gymnastics.** The athletic exercises practiced among the Greeks and Romans partook of the nature of our modern track events combined with what is now commonly termed gymnastics. The usual acceptation of the term in our day covers more especially that part of the education of youth consisting of bodily exercises within doors in gymnasia and with appliances. Of these appliances the principal are the horizontal bar, the parallel bars, the flying rings, the trapeze, the horse, the ladders, pulleys, chest weights, Indian clubs, medicine ball, wand, dumb-bells, and the like.

**Gymnoasceæ.** Order of Fungi of the sub-class *Ascomycetes,* parasitic on trees and other plants.

**Gymnoblastea-Anthomedusæ.** See TUBULARIÆ.

**Gymnobranchia.** Subdivision of *Haplomorpha,* including PHYLLIRHOE (q.v.).

**Gymnocarpi.** Division of lichens having open apothecia, the ends of the asci being exposed.

**Gymnochroa.** See ELEUTHEROBLASTEA.

**Gymnocopa.** Group of chætopod worms having long flat bodies, broad in front (where alone are parapodias, two-lobed and non-setose), two or four short feelers, two long tentacles, and bristles are present. See ERRANTIA.

**Gymnocytode,** or GYMNOCYTE. Cytode (cell) without shell or membrane.

**Gymnodontes.** See PLECTOGNATHI.

**Gymnolæmata** (STELMATOPODA). Ectoproctous *Bryozoa* (nearly all marine), with disk-shaped lophophore and no epistome. There are three tribes, *Cyclostomata, Ctenostomata,* and *Chilostomata.*

**Gymnomonera.** Monera having no encysted stage. *Protamœba* is an example. This differs from an ordinary *Amœba* in being smaller, in having the pseudopodia thread-like, numerous, and interlacing, and in having no nucleus.

**Gymnomyxa.** Grade of *Protozoa,* including the *Proteana, Plasmodiata, Lobosa,* and *Filosa;* equivalent to the old group *Rhizopoda* plus *Mycetozoa.* This group includes one-celled animals that have no firm skin, the substance (protoplasm) of whose bodies can flow out into threads and in infinite ways change their shape.

**Gymnophiona** (APODA, OPHIOMORPHA, CŒCILIA, PEROMELA, OPHIDIOBATRACHIA). Worm-shaped *Amphibia* without limbs, with biconcave vertebræ and persistent notochord. The skin is covered with small scales arranged in transverse rings. They were originally included with the snakes; they have more than 250 vertebræ; the left lung is rudimentary. The larva breathes by gills. The eyes are small and concealed; peculiar tentacles (balancers) arise from the anterior part of the sockets. They burrow like earthworms, and are found in S. America, w. Africa, and the E. Indies.

**Gymnorhina.** Tribe of *Microcheiroptera,* characterized by having no nasal appendages, as in other Bats. Here belong the VESPERTILIONIDÆ (q.v.).

**Gymnosomata.** Naked *Pteropoda,* with a head bearing tentacles, and fins separate from the foot. The larvæ have rings of cilia. *Clio* has a spindle-shaped body and no gills. *Limacina,* an allied form, is the chief food of Whales. *Pneumodermon* has external gills and two protrusible arms, beset with suckers, placed close to the anterior edge of the gills, and thus behind the head.

**Gymnosophists.** Ascetics in India who went nearly or quite naked, and sought by seclusion and self-inflicted tortures

Gymnosophists.

and privations to attain sanctity or a reputation for it. Name given to the FAKIRS (q.v.) by the Greeks in Alexander's time.

**Gymnospermæ.** Class of plants of the sub-kingdom *Spermatophyta,* bearing the ovules on naked scales, not inclosed in an ovary, the seeds consequently also naked; including the three natural families *Coniferæ, Cycadaceæ,* and *Gnetaceæ.*

**Gymnospermia.** Order of the Linnæan class *Didynamia,* including many plants of the Mint family, having four seeds which when mature lie naked in the calyx.

**Gymsperms.** See GYMNOSPERMÆ.

**Gymnospore.** Spore not contained in a sporocarp or conceptacle.

**Gymnostomous.** Mouth of the sporange of mosses when devoid of cilia or processes.

**Gymnothalmata.** See HYDROMEDUSÆ.

**Gymnotoka.** See TUBULARIÆ.

**Gymnotus.** See APODA.

**Gynæcology.** Branch of medicine which embraces the diseases peculiar to the female sex.

**Gynæcophore,** or GYNOPHORE. Female gonophore, or one containing ova only.

**Gynæcophoric Canal.** See CANALIS GYNÆCOPHORUS.

**Gynandria.** Linnæan class of plants, distinguished by having the stamens attached to the pistil, as in the Orchids and Virginia Snakeroot.

**Gynandrophore.** See GONOPHORE.

**Gynandrosporous.** Certain Fungi and Algæ which bear both male and female spores.

**Gynandrous.** Flowers with the pistils and stamens united.

**Gynantherous.** Flowers in which the stamens are transformed into pistils.

**Gynobase.** Short, broad disk, borne on, or a portion of, the torus of a flower, as in the natural family *Rutaceæ*.

**Gynodiœcious.** Plants bearing hermaphrodite flowers on one individual and perfect flowers on another.

**Gynœcium.** Pistils of a flower, collectively.

**Gynomonœcious.** Plants bearing both hermaphrodite and pistillate flowers on the same individual.

**Gynophore.** Stipe which supports the pistils of a flower, separating them from the stamens, as in *Cleome*.

**Gynostegium.** United stamens which partly or wholly cover the pistils in plants of the Milkweed family; also other structures which overlap or cover the gynœcium.

**Gypogeranidæ.** Family of Raptatorial birds, having slender body, long neck, legs, wings, and tail, including the SECRETARY BIRD (q.v.).

**Gypsies.** Wandering hordes of supposed Hindu origin, that first appeared in w. Europe 1417, and are now spread over the world. Called Bohemians by the French, Egyptians (corrupted into Gypsy) by the English, and by themselves Rommany. Their language contains ab. 5,000 words. They probably entered s.e. Europe in 11th century. They are thieves and sleight-of-hand performers, tinkers, peddlers, shop-keepers, and strolling minstrels; the women often tell fortunes and sell love-potions. They have no system of religion, but show traces of pagan superstitions.

Gypsies.

**Gypsum.** $CaSO_4.2H_2O$. Hydrous calcium sulphate, very abundant in many sedimentary formations and frequently present in natural brines. It occurs as a soft, easily cleavable, crystalline mineral (selenite), in fine granular forms (alabaster), and in coarse masses (rock-gypsum). The purest qualities of calcined gypsum are known as stucco and plaster of Paris. In the U. S., Mich. and Kansas are now among the largest producers. Commercial gypsum is always more or less impure, the impurities, usually carbonate of lime, amounting to from five to more than forty per cent. Formerly large quantities of gypsum were used as a direct fertilizer with excellent results, especially upon the clover plant, though its action was never well understood. Of late its use has largely ceased, and it is now used mainly as an absorbent in composting farm manures, its power of fixing ammonia rendering it very useful in this respect.

**Gypsy Moth** (*Ocneria dispar*). European insect, introduced into U. S. Very destructive in Mass.; it attacks trees, shrubs, garden and field crops. The female moth is the larger, and measures two inches across expanded wings. She is yellowish white, with wavy rows of brown on the wings; the fore-

Gypsy Moth (*Ocneria dispar*).

wings have at the center a kidney-shaped spot. Eggs are laid in clusters in protected crevices in midsummer, and hatch in spring or early summer into blackheaded larvæ, two inches long when full grown, dark colored, hairy, and having blue and red tubercles on each segment.

**Gypsy Music.** The fact that the itinerant musicians of Hungary, and, in less degree, of Russia and Spain, are largely gypsies, has given rise to the belief that much of the national music of those countries is of gypsy origin. The fact seems to be that these singular nomads have done nothing in music but to assimilate that of the people among whom they live, and impress upon it certain peculiarities which are Oriental in nature, and may therefore be said to be native to the practitioners. These are intervallic and rhythmical, but chiefly disclose themselves in an excess of florid ornament which is out of keeping with Occidental music.

**Gyrantes.** See COLUMBINÆ.

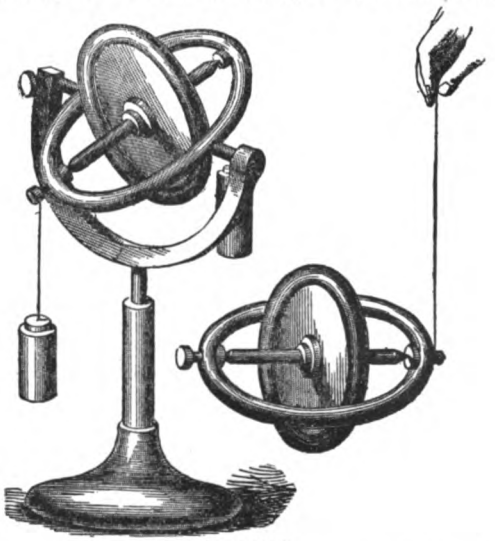
**Gyration,** RADIUS OF. The distance from an axis to a point in a revolving body, such that, if the entire weight were there concentrated, the same force would cause the same angular motion as actually obtains. For a plane surface it is found by taking the square root of the ratio of its moment of inertia to its area.

**Gyrencephala.** Group of Mammals, including the Whales, Seals, *Carnivora*, Elephants, Ungulates, and *Quadrumana*. They have the cerebral hemispheres convoluted, but not entirely covering the cerebellum and olfactory lobes. A corpus callosum is present.

**Gyrfalcons.** Arctic birds, the largest of the falcons; they breed within the Arctic Circle, but the young visit Europe as far s. as Germany. Of the several species, *F. candicans* of Greenland is distinguished by being pure white at every season.

**Gyrodactylus.** See POLYSTOMEA.

**Gyroscope.** Instrument designed to demonstrate the action of a rigid body when rotating on an axis about which it



Gyroscope.

is kinematically symmetrical. The first, invented by Bohnenberger 1810, consisted of a spheroid capable of rotating about one of its principal axes within a circular ring, the axis of revolution being coincident with a diameter of the ring. This ring with its contents was similarly movable about an axis which was the diameter of another ring, and again for a third ring, the three axes of revolution being at right angles to each other, so that the spheroid had all degrees of freedom for rotating. Foucault devised a similar instrument for demonstrating the rotation of the earth. In virtue of the principle which he called the fixity of the plane of rotation, and which Thomson and Tait have recently called gyrostatic domination, the axis of a rotating rigid body tends to preserve a fixed direction in space.

**Gyrostat.** Modification of the gyroscope, devised by Lord Kelvin to illustrate the dynamics of rigid bodies. It consists essentially of a heavy fly-wheel, very delicately balanced and capable of being set in rotation on a horizontal axis.

**Gyrostatic Domination.** See GYROSCOPE.

**Gyulai,** or **Gyulay,** IGNATIUS, COUNT, 1763–1831. Ban or Viceroy of Croatia, Dalmatia, and Slavonia, 1806; Field-marshal 1813; Pres. Aulic Council 1830.—His son, FRANZ, 1798–1868, was Austrian Field-marshal 1846; Minister of War 1850; commanded the army of Italy 1857, and was defeated at Magenta.

# H

**Haach,** LUDWIG, 1813–1841. German historical painter. Principal work, *Christ in the Storm.*

**Haag,** GEORG MARCEL, 1652–1719. German historical and portrait painter. His *Magdalen* in the church at Nordlingen is famous.

**Haag,** KARL, b. 1820. Genre painter; has lived much in the East; Legion of Honor 1879. Court painter to Duke of Coburg-

Danger in the Desert (by Karl Haag).

Gotha. He paints principally Bedouin subjects. *Bivouac, Well, Desert Hospitality, Danger in the Desert.*

**Haag,** TETHART PHILIPP CHRISTIAN, 1737–1812. Portrait and horse painter, director of the Hague Academy.

**Haar,** BERNARD TER, D.D., 1806–1880. Dutch poet, prof. at Utrecht 1854–74.

**Haarlem.** City of the Netherlands, 10 m. w. of Amsterdam; noted for its trade in flower roots and for its cathedral, said to contain the largest and finest organ in the world. It suffered from a great fire 1493, and from the plague in 1509; was taken by Alva after 7 months' siege, July 1573, and many of the inhabitants butchered; was inundated 1775 and 1791. Pop., 1891, 53,692.

**Haarlem Lake.** In n. Holland, formerly covering ab. 50,000 acres; but drained 1848–52, and now under tillage.

**Haase,** HEINRICH GOTTLOB FRIEDRICH, 1808–1867. Prof. Breslau from 1840; ed. Tacitus, Thucydides, and other classics.

**Habakkuk.** Hebrew prophet, author of 35th O. T. book, ab. 625 B.C.

**Habberton,** JOHN, b. 1842. American journalist and novelist. *Helen's Babies,* 1876; *Jericho Road,* 1877; *Brueton's Bayou,* 1886; *All He Knew,* 1890.

**Habeas Corpus.** Judicial writ commanding one who detains another to have the latter, at a specified time and place, to be dealt with according to law: a high prerogative writ, carefully secured in Great Britain and the U. S. by constitutional and statutory provisions.

**Habington,** WILLIAM, 1605–1645. English poet. *Castara,* 1634.

**Habit.** In Botany, general external features of a plant.

**Habit.** In organic, and more particularly in animal life, the effect of repetition in making physical and mental processes easier and more automatic, a result due to the so-called plasticity of the materials of which living bodies are composed. Underlying the phenomena of habit there is no doubt a physical principle. When an impulse has once traversed a nerve-tract and called out a new movement of the body, it has, so to speak, broken the way; the passage of a similar impulse a second time over the same tract is made easier, and if repeated often enough, any given movement may become partially or wholly subconscious, as in almost all of the familiar actions commonly and repeatedly performed in our daily life; *e.g.,* walking, eating, writing. It is of the greatest importance that these routine performances of life should be matters of habit, since it is only by being relieved of the necessity of continually consciously attending to such activities in all their details that the mind is left free to advance in other directions. The ethical importance of the phenomena of habit is obvious. The plasticity of the system, which allows the formation of habits, is much greater in early life than later.

**Habit.** MONASTIC. All the Orders wore black or white except the Franciscans whose original color was gray, the Reformed Franciscans wore a dark-brown tunic. Black was worn by Benedictines, Augustines, Serviti, Oratorians, and Jesuits; white by Cistercians, Port Royalists, Trappists, Trinitarians and Camaldolesi. Dominicans wore black over white, and Carmelites and Præmonstratensians white over black.

**Habitat.** Natural environment of a plant or animal; region inhabited by any species.

**Habsburg.** See HAPSBURG.

**Hache.** Battle-ax of varied form used by mounted knights and men-at-arms. It appears on the Bayeux tapestry and

Hache (French MS. ab. 1250).

lasted till the 15th century. It came into w. Europe with the Norse conquerors.

**Hachette,** LOUIS, 1800–1864. Publisher in Paris from 1826.

**Hackaert,** JAN, b. ab. 1636. Dutch landscape painter. His best pictures are in the Amsterdam Gallery.

**Hackberry.** *Celtis occidentalis.* Small tree of the Elm family, bearing edible fruit, native of the e. and s. U. S.; known also as Sugarberry, Nettle Tree, and Bastard Elm.

**Häckel,** ERNST. See HAECKEL.

**Hackett,** HORATIO BALCH, D.D., LL.D., 1808–1875. Prof. Newton Theol. Inst. 1839, and at Rochester 1870; N. T. reviser. *Commentary on Acts*, 1851; *Illustrations of Scripture*, 1855.

**Hackett,** JAMES HENRY, 1800–1871. American actor.

**Hackländer,** FRIEDRICH WILHELM, 1816–1877. German novelist and dramatist. *Handel und Wandel*, 1850; *Roman meines Lebens*, 1878. Works, 60 vols., 1855–74.

**Hackmatack.** See TAMARACK.

**Hackney.** Suburb and parliamentary borough in n.e. London, formerly very fashionable. Pop., 1891, 229,500.

**Haco.** See HAKON.

**Haddock** (MELANOGRAMMUS ÆGLEFINUS). Member of the same family of fishes as the COD (q.v.), from which it differs in having a smaller mouth and more pointed dorsal-fin. It averages 4 lbs. in weight, is caught with the cod, and takes salted menhaden as bait. It spawns on the bottom in May. The Scotch method of curing Finnan haddies (from Finnan, Scotland) has been introduced at Portland, Me., and Boston. See GADIDÆ.

**Haddon Hall.** Old manorial seat of the Vernons in Derbyshire, England, architecturally fine and beautifully preserved.

**Hade.** Angle a mineral vein makes with a vertical plane, the vein and the plane having the same strike; the complement of the dip. Also called Underlay.

**Haden,** FRANCIS SEYMOUR, SIR, b. 1818. English etcher. Faultless in drawing; with a keen eye for all the salient points in the landscape before him, with a temperament that gives rare decision to his strokes, he adds a graceful movement to his lines that is as rare as it is beautiful. He is best known by his *Sunset on the Thames, The Towing Path, Shere Mill-Pond*, and the *Agamemnon*. His most ambitious plate is *Calais Pier*, which has been mezzotinted.

**Hades.** Greek god of the nether world; same as Roman Pluto; son of Cronos, brother of Jupiter and Neptune; husband of Persephone, whom he carried from the upper world; giver of all blessings which come from the earth, and so god of wealth.—Also, world of the dead, equivalent to Hebrew Sheol; in English Bible imperfectly translated Hell. See CERBERUS, PLUTO, PROSERPINE, CHARON, STYX, ELYSIAN FIELDS, DANAIDES, FURIES, SISYPHUS, IXION, and TANTALUS.

Hades.

**Hading,** JANE, b. 1859. French actress, first known in England and America 1885.

**Hadj,** or HAJJ. Pilgrimage to Mecca, entitling him who has made it to the prefix Hadji; important in the Moslem System; now made annually from Constantinople.

**Hadji Khalifah,** MUSTAPHA BEN ABDULLAH, d. 1658. Turkish historian and bibliographer. *Maritime Wars of the Turks*, tr. 1831.

**Hadley,** JAMES, 1821–1872. Prof. Yale from 1848. *Greek Grammar*, 1860; *Elements of Greek*, 1869; *Roman Law*, 1873; *Philological and Critical Essays*, 1873.—His son, ARTHUR TWINING, b. 1856, prof. Yale 1886, has pub. *Railroad Transportation*, 1885, and other economic works.

**Hadley,** JOHN, F.R.S., 1682–1744. English inventor of a quadrant and a reflecting telescope.

**Hadley's Principle.** Law assumed by George Hadley 1744, according to which a body projected meridionally north (or south) gradually deviates to the east (or west) because it retains its eastward velocity while passing over regions that move with less (or greater) eastward diurnal rotatory speed. On this principle Hadley based an explanation of trade winds and anti-trades, whose fallacy was first exposed by Ferrel 1856.

**Hadrian,** PUBLIUS ÆLIUS, 76–138. Fourteenth Roman emperor, succeeding Trajan 117; an able and accomplished man, in whom noble and base elements were strangely mingled; an incessant traveler, a great patron of architecture, and in the main a wise and liberal ruler. He abandoned to the Parthians the regions e. of the Euphrates, and suppressed a Jewish revolt 132–135. His reign was prosperous and unusually peaceful. His coinage is the finest in the imperial series. The lines ascribed to him, when near death, "Animula vagula blaudula," are famous.

Hadrian.

**Hadrian,** or ADRIAN, I., Pope 772–795. Charlemagne confirmed his temporal rights 774.—II., 867–872.—III., Agapetus, Pope 884–5.—IV., Nicholas Breakspeare, b. in England ab. 1100; abbot of St. Rufus, near Avignon 1137, Bp. of Albano 1146, Pope 1154–59. He had trouble with Arnold of Brescia and Frederic I.—V., Ottobons Fieschi, Pope 1276.—VI., Rodenbusch, or Dedel, b. in Utrecht 1459; prof. at Louvain, tutor of Charles V., Bp. and Regent of Spain 1520, Pope 1522–23. He made vain efforts at reform.

**Hadrian's Mole,** or MAUSOLEUM. See SANT' ANGELO, CASTLE OF.

**Hadrian's Wall.** See WALL OF HADRIAN.

**Hadrosaurus.** See DINOSAURIA.

**Haeckel,** ERNST, b. 1834. German naturalist of great learning and activity, consistent champion of evolution; prof. Jena since 1862. His *Natural History of Creation*, 1868, has been tr. into 12 languages. *Radiolarians*, 1862; *Morphology*, 1866; *Calcareous Sponges*, 1872; *Evolution of Man*, 1874; *Plastidules*, 1876; *Medusæ*, 1879.

**Hæmal Arches.** Ventral processes of bone, inclosing the dorsal aorta as it runs below the vertebral column; found especially in the tail of back-boned animals, and known as chevron bones.

**Hæmapophysis.** Ventral or hæmal arch of the vertebræ.

**Hæmatein.** $C_{16}H_{12}O_6$. Coloring matter derived from logwood; obtained from hæmatoxylin by gentle oxidation; reddish brown plates, soluble with difficulty in water. It gives a violet black with iron mordants and by other methods.

**Hæmatemesis.** Vomiting of blood.

**Hæmatin.** Substance containing carbon, hydrogen, nitrogen, iron, and oxygen; obtained by the action of acids and alkalies on hæmoglobin; brown pigment, containing the constituents of the coloring matter of blood.

**Hæmatocele.** Accumulation of blood in the tissues when not extensively diffused, forming a tumor.

**Hæmatoma.** Tumor consisting of blood effused into the tissues.

**Hæmatoperetic.** Contributing to the formation of the blood or its elements.

**Hæmatoxylin.** $C_{16}H_{14}O_6$. Coloring principle combined as a glucoside in logwood; extracted by water from the wood, and thus present in logwood extract; colorless prisms soluble with difficulty in cold water; changed by oxidation to hæmatein.

**Hæmatozoa.** Animals parasitic in the blood, as the *Filariidæ*.

**Hæmaturia.** 1. Discharge of blood with the urine, which may be derived from the urethra, bladder, or kidneys. 2. Passage of dark-colored urine by horses, especially mares in heat. 3. Similar condition in sheep, due to inflammation of the kidneys.

**Hæmodoraceæ.** Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Monocotyledons*, comprising ab. 27 genera and 125 species, natives of Australia, s. Africa, N. and S. America, and central and e. Asia; commonly called the Bloodwort family.

**Hæmoglobin.** Coloring matter of the red blood-corpuscles, made up of a proteid (globin) and hæmatin. It combines readily with oxygen, forming an oxycompound, which yields its oxygen to the organism. It acts thus as a carrier of oxygen to the system.

**Hæmoptysis.** Spitting of blood, which may have its origin in the larynx, trachea, or lungs.

**Hæmorrhage.** Bleeding or flow of blood from the vessels. When from an artery, the blood is bright-colored and is thrown out in a jet which oscillates synchronously with the beating of the heart; when from a vein, it is dark-colored and oozes in a steady current. The former is controlled by pressure on the artery on the side nearest the heart by the hand or a cord, and in wounds of large arteries by tying a ligature tightly around them. Venous hæmorrhage usually ceases spontaneously, unless the wounded vein is of large size, and may be controlled by pressure on the side away from the heart. Alum, copperas, and cold, when applied to the wound, and turpentine internally, will assist the above procedures.

**Hæmorrhoids.** Piles: small tumors outside (external) or inside (internal) the anus, freely supplied with blood-vessels. The internal variety rarely protrude except after defæcation, and are also denominated itching, bleeding, or blind. An operation is necessary to effect a permanent cure, although laxatives, cold applications, astringents, and the avoidance of alcoholics and highly-seasoned food, will render them less annoying. The internal variety occasionally extrude in such masses that their return is impossible, and sloughing occurs, which is very painful, but results in a cure. External piles may be cured by incision or astringents.

**Hæmsted,** ADRIAN, ab. 1525–1562. Dutch Anabaptist, twice driven from England 1560–61. *Book of Martyrs*, 1559.

**Hæmus.** Range of mountains between Thrace and Mœsia; now the Balkans.

**Hæres.** Successor to all the property, rights and liabilities of a deceased person, under the Roman law; possessing some of the powers of the English executor, and some of the devisee.

**Haff.** Shallow lagoon on the Baltic coast. The three largest are at the mouths of the Memel, Vistula, and Oder.

**Hafiz,** MUHAMMED SHAMSUDDIN, d. 1388. Greatest of Persian lyrical poets. Some of his works have been widely translated and repeatedly into English; the *Divan* is the most important collection of them.

**Hag.** See MYXINOIDÆ.

**Hagar.** Sarah, the barren wife of Abraham, gave her Egyptian slave Hagar to her husband, by whom Ishmael was born. After the birth of Isaac by Sarah, jealousy caused Hagar and Ishmael to be driven from the paternal home. The Ishmaelites were their descendants, and formed 24 tribes of Nomads in Babylonia. Hagar's dismissal has formed a favorite theme of Christian art.

Expulsion of Hagar (by A. Van der Werff), Dresden Gallery.

**Hagberg,** JAKOB THEODOR, Ph.D., b. 1825. Swedish dramatist, critic, and tr. Calderon; prof. at Upsala 1860.

**Hagedorn,** FRIEDRICH VON, 1708–1755. German lyric poet.

**Hagen,** G. H. LUDWIG, 1829–1893. Prof. of Hydraulics at the Technical Academy, Berlin; author of the best determination of the absolute resistance of plane plates to the wind.

**Hagen,** HERMANN AUGUST, Ph.D., 1817–1893. Prof. of Entomology at Harvard from 1870.

**Hagenau,** REMNIER VON, 12th century. German lyric poet.

**Hagenbach,** KARL RUDOLF, D.D., 1801–1874. Prof. at Basel from 1824. *Theol. Encyc. and Methodology*, 1833, tr. 1884; *History of Doctrine*, 1840, tr. 1880; *Ch. History*, 7 vols., 1869–72, tr. 1869–78.

**Hagerstown.** Capital of Washington co., Md., on Antietam Creek, 20 m. n.w. of Harper's Ferry. Pop., 1890, 10,118.

**Haggada.** Part of the Midrash; body of legends illustrating O. T. See HALACHA.

**Haggai.** Hebrew prophet, author of 37th O. T. book, 520 B.C., encouraging the Jews to go on rebuilding the Temple.

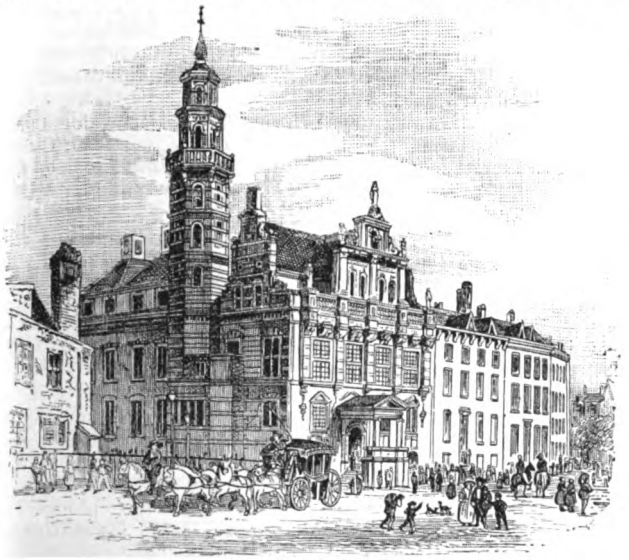
**Haggard,** HENRY RIDER, b. 1856. English novelist. Resident in Africa 1875–79, he found there the materials for his chief successes. *King Solomon's Mines*, 1886; *She*, 1887; *Allan Quatermain*, 1887; *Cleopatra*, 1889; *Nada*, 1891.

**Haggis.** Celebrated Scotch dish, commonly made in a sheep's stomach of the lungs, liver and heart of the same animal, minced fine, with oatmeal, suet, and spices.

**Hagiographa.** 3d section of O. T.; I. and II. Chronicles, Ezra, Nehemiah, Esther, the poetical books, and Daniel.

**Hagiolatry.** Saint-worship, prevalent in R.C., Greek, and Oriental Churches.

**Hague.** City of the Netherlands, residence of the King and Court. It contains a valuable museum and gallery. Here



Buildings at the Hague, Holland.

sundry treaties were signed, as in 1659, 1668, and 1717. Pop., 1890, 160,531.

**Hague,** GALLERY OF THE. Small, but excellent collection of paintings, mainly Dutch and Flemish. It contains Paul Potter's *Young Bull*, Rembrandt's *Anatomy Lesson*, fine portraits by Rembrandt and Reubens, and a series of magnificent specimens by the Dutch genre painters.

**Hague,** ARNOLD, b. 1840. Geologist, employed on U. S. Surveys 1867–77, and later. *Volcanoes*, 1883; *Volcanic Rocks*, 1884; *Nevada*, 1885.

**Hahnemann,** CHRISTIAN FRIEDRICH SAMUEL, 1755–1843. Founder of homeopathy; medical reformer, practicing at or near Leipzig 1789–1821, then at Cöthen, and from 1835 in Paris; much persecuted for some years by druggists and physicians. His "law of similars" was announced 1796. *Friend of Health*, 1792; *Organon of Medicine*, 1810; *Materia Medica*, 1810–21; *Chronic Diseases*, 5 vols., 1828.

**Hahn-Hahn,** IDA, COUNTESS, 1805–1880. German novelist.

**Haidinger,** KARL VON, 1756–1797. Austrian mineralogist, author of an Essay toward a Systematic Division of the Different Kinds of Rocks, 1786.

**Haidinger,** WILHELM VON, 1795–1871. Austrian geologist and mineralogist. *Handbuch der bestimmenden Mineralogie*, 1845.

**Haiderabad.** See HYDERABAD.

**Haiduk.** Protestants of e. Hungary, settled on the Theiss 1605 with special privileges.

**Hail.** Vapor carried upward by whirlwind into cold regions and congested to ice, which accumulating forms masses, sometimes of 3 lbs. weight. In summer of 1889 great damage was accomplished by hailstorms in Europe.

**Hailes,** LORD. See DALRYMPLE, SIR DAVID.

**Haileybury College.** Conducted 1809–58, near Hertford, Eng., by East India Co., for the training of officers for their service; converted into a public school 1862. Many eminent men taught or studied there.

**Hainan.** Island between the China Sea and the Gulf of Tonquin, belonging to China, 160 m. long by 90 wide. Area ab. 14,000 sq. m. Pop. ab. 2,500,000.

**Hainault.** Belgian province, formed 1815; long connected with Flanders, Bavaria, and Burgundy. Much of its former territory was annexed to France 1659. Capital, Mons; area 1,437 sq. m.; pop., 1891, 1,058,737.

**Hair.** Assyrians and Greeks had a natural fondness for long hair and gave it great care and ornamentation. The Egyptians removed it as an uncleanly incumbrance and shaved even their children's heads, but they wore wigs. The Hebrews kept a middle course and cropped their hair short with scissors, as did the Romans, who also removed the beard till Commodus, to conceal a wry neck, brought it into fashion. The satirists, however, frequently attacked the effeminate foppery of long hair, as did St. Paul. The barbarians neither shaved nor cropped, tonsure being a mark of servitude, and long hair became universal, except when the Church forbade it as savoring of paganism. The long-haired Normans especially incurred this censure, but their faces were clean-shaven, and the Conqueror forced the Saxons to shave. In the 12th century the hair and beard were worn long and carefully trimmed in fantastic shapes. Men swore by their beards, and to have them

1160 1160 1200

cut off was as great a mark of indignity as in the East. The inconveniences attending the wearing of long hair and beard with elaborate armor necessitated free use of the razor and scissors, and from 1200–1500 flowing locks were distinguishing vanities of courtiers and idle youth. Then came the Italian fashions through France of peaked beard and long hair; the

1350 1380 1400

Spanish styles followed in Elizabethan days, the hair increasing in luxuriance under the Stuarts with the exception of the Puritans, who cropped in protest. Cavalier locks reached their height in the enormous wigs of the Restoration, and though from ab. 1690 to ab. 1840 the face was clean shaven yet the wig, infinitely varied, kept its place almost as long. See HEADDRESS.

**Hair.** Cylindrical elongated appendage derived from the skin in which it is implanted in a small pit or follicle by a bulbous expansion or root. Beyond the skin it consists of a central marrow, a collection of polyhedral cells, next a layer of long fibers between which is coloring matter, and externally of a layer of horny cells.

**Hair.** Slender appendages to the epidermis of plants.

**Hairbell.** See HAREBELL.

**Hair Compasses.** Dividers having one leg adjustable by means of a fine screw that works against a spring.

**Hair Dressing.** See HEAD-DRESSES.

**Hair Dyes.** Among the Greeks, auburn, the color of Aphrodite's tresses, was considered most beautiful, and drugs were used in which the hair was dipped and exposed to the sun and thus acquired the coveted hue. The ladies of Rome, Byzantium and Venice used similar arts to produce the Titian tint, but metallic dyes are comparatively modern. For blonde hair peroxide of hydrogen is used and pyrogallic acid for brown. For black hair the best process is a bath of sulphide of potassium, followed by one of nitrate of silver. Various salts of bismuth, lead and mercury are also used, though all are more or less injurious.

**Haireddin.** See BARBAROSSA.

**Hair Grass.** Delicate capillary grasses of the genera *Agrostis*, *Deschampsia*, and others.

**Hair Powder.** The ancients sprinkled their hair with gold-dust, and powder of various colors has frequently been fashionable, but its great reign in w. Europe lasted from 1590 to 1795, when a tax of a guinea a head killed it.

**Hair-Spring.** Coil of fine steel wire weighing ab. $\frac{1}{4000}$ oz., used to return the impulse given to the balance of a watch by the crown-wheel of the escapement.

**Hair-Trigger.** Trigger connected with the tumbler catch of the gun lock by a fine spring called the hair. This spring, released by a very slight pressure, strikes the tumbler catch which unlocks the tumbler and thus fires the gun; used with sporting arms and telescopic rifles for fine shooting.

**Hair Worm,** or HORSEHAIR WORM. See GORDIACEA.

**Haiti,** or HAYTI. Second in size of the West India Islands; discovered by Columbus 1492; ab. 400 m. long and 60 to 150 broad; area 29,827 sq. m. The interior is intersected by mountain ranges. The soil is fertile, producing sugar and coffee. Its area is divided between two republics, H. and Dominica. It was at different times under French and Spanish rule, and

Haiti—General View of Port-au-Prince.

in 1793 was invaded by a British force. Toussaint l'Ouverture at the head of an army of blacks came to the defense of the French, and secured the independence of the country, which from 1804 was governed by negro Presidents or Emperors. The e. part was set off 1843 as DOMINICA (q.v.). H. has an area of ab. 10,200 sq. m.; pop. ab. 600,000. Capital, Port-au-Prince.

**Hajj.** See HADJ.

**Hakluyt,** RICHARD, D.D., ab. 1553–1616. Prebendary of Westminster 1602, famous for his *Voyages*, 3 vols., 1598–1600. The Hakluyt Society was founded 1846 to publish narratives of early travels.

**Hakodate.** Port of Yezo, Japan. Pop., 1890, 45,517.

**Hakon,** or HACO, ab. 920–961. King of Norway; at war with the Danes.—Another, d. ab. 995, son of Sigurd, ruled the n. and w. of Norway.—Hakon V., King 1223–63, added Iceland and Greenland to his dominions, and attacked Scotland.

**Halacha.** Body of Jewish legal tradition, interpreting the O. T.; forming, with the HAGGADA (q.v.), the Midrash.

**Halbert.** Development of the HACHE (q.v.). Its derivation *alle barte* (cleave all) explains its use. It consisted of a pole 5 ft. long with a partly crescent-shaped steel head, frequently spiked. It finally became a ceremonial weapon for home-troops or palace guardsmen.

Halbert ab. 1500

**Halberstadt.** Town of Prussian Saxony, seat of a bishop 820. Its cathedral, built ab. 1400, was restored 1850–71. Pop., 1890, 36,501.

**Halbertsna,** FJALLING, b. 1841. Prof. Utrecht; writer on gynæcology.

**Halcyon.** See ALCEDINIDÆ.

**Halcyon Days.** Seven before and seven after winter solstice; anciently supposed to be a period of calm and of the Kingfisher's incubation.

**Halcyonidæ.** See LEVIROSTRES.

**Haldane,** ROBERT, 1764–1842. Scottish evangelist, who used his wealth in building chapels and educating preachers. *Books of O. and N. T.*, 1830.—With him was associated his brother, JAMES ALEXANDER, 1768–1851, pastor in Edinburgh from 1799. *Atonement*, 1847.

**Haldat's Figures.** If one pole of a strong magnet be used as a pencil and a pattern be traced upon a thin steel plate, the latter may be locally magnetized, and if sifted over with iron filings, some of the figures may be found to be very complicated. These are known as Haldat's figures.

**Haldeman,** SAMUEL STEHMAN, LL.D., 1812–1880. Assistant on the N. J. Survey 1836, and on that of Pa. 1837–42; prof. Univ. Pa. 1851–55 and from 1869; founder and pres. of the Philological Society. *Analytical Orthography*, 1858–60; *Pa. Dutch*, 1872; *Word-building*, 1881.

**Hale,** EDWARD EVERETT, D.D., b. 1822. Essayist, novelist, and philanthropist, Unitarian pastor in Boston since 1856; ed. *Christian Examiner*, 1857–63, *Old and New*, 1870–75, and *Lend a Hand* from 1886. His *Man Without a Country*, 1863, is perhaps the most famous of short stories; his *Ten Times One is Ten*, 1870, exerted a wide influence. *My Double*, 1859; *Ingham Papers*, 1869; *Sybaris*, 1871; *In His Name*, 1874; *East and West*, 1892; *A New England Boyhood*, 1893.

**Hale,** HORATIO, b. 1817. Ethnologist; on U. S. Pacific exploring expedition 1838–42; in Canada since 1856. *Ethnography and Philology*, 1846; *Iroquois Book of Rites*, 1883; *Blackfoot Tribes*, 1885.—His mother, SARAH JOSEPHA (BUELL), 1788–1879, edited *Godey's Ladies' Book*, 1837–77, and was a prolific writer. *Woman's Record*, 1853–69.

**Hale,** JOHN PARKER, 1806–1873. M. C. from N. H. 1843–45; U. S. Senator 1847–53 and 1855–65; Free-soil candidate for Pres. 1852; Minister to Madrid 1865–69.

**Hale,** SIR MATTHEW, 1609–1676. Judge of Common Pleas 1654–58; knighted 1660; chief baron of Exchequer 1660; Chief-justice of King's Bench 1671–76. *History of the Pleas of the Crown*, 1716; *Hist. Common Law*, 1713.

**Hale,** NATHAN, 1755–1776. Patriot of the Revolution, Captain of Conn. troops 1775. He undertook to find out the strength of the British forces in and about New York, but was captured while returning and hanged as a spy by order of Gen. Howe. His heroic death made him a national hero. Statues of him were erected at Hartford 1887 and in New York 1893.—His nephew, NATHAN, LL.D., 1784–1863, father of Edward E., ed. Boston *Advertiser* from 1814.

**Halecomorpha.** See AMIADES.

**Hales,** JOHN, 1584–1656. Prof. at Oxford 1612; Canon of Windsor 1639, ejected 1642; called "ever memorable"; famed for learning and liberalism. *Golden Remains*, 1659; *Works*, 3 vols., 1765.

**Hales,** STEPHEN, 1677–1761. English divine, pioneer in pneumatic chemistry. *Vegetable Statics*, 1727; *Hæmastatics*, 1733.

**Hale's Rocket.** War rocket invented by William Hale in 1846, and afterward (1867) so improved as to supersede the Congreve rocket in the British service. It consists of a metal cylinder, a solid head and an interior filling. The tail piece has three conical vents, which are cut away on one side so as to leave three projecting wings against which the escaping gas acts and causes the rocket to rotate around its longest axis.

**Halévy,** JACQUES FROMENTAL ELIE, 1799–1862. French composer of operas; pupil and prof. of the Paris Conservatoire; best known by his tragic masterpiece *La Juive*, and his sparkling comic opera *L'Eclair*, both 1835. His other operas, over 20 in number, live only in the records. Uncle of Ludovic.

**Halévy,** LUDOVIC, b. 1834. French dramatist, novelist, and critic; Academician 1886. With Henri Meilhac he wrote *Froufrou* and many other plays, besides the librettos of most of Offenbach's operas bouffe. *Abbé Constantin*, 1882; *Parisian Points of View*, 1894.—His father, LÉON, 1802–1883, was a playwright and translator.

**Half-Breed.** Issue of parents of different races, especially of redskins and whites. In the n.w. Territories the half-breeds

Louis Riel and Half-breed Scouts.

rebelled against the Dominion Government 1885, but they were soon subdued, and Louis Riel, their leader, was hanged the same year.

**Halfdan,** THE BLACK, d. 860. Father of Harold Haarfager, and ancestor of the Kings of Norway to 1130.

**Half Pay.** Emolument given to all officers of the British service retired after 25 years' active service; also to all field officers who after serving 5 years as such with a regiment are not re-employed. British wounded or invalided officers under 25 years full pay service may also be temporarily placed on half pay. In the U. S. service the retiring pay is three-fourths of the active pay.

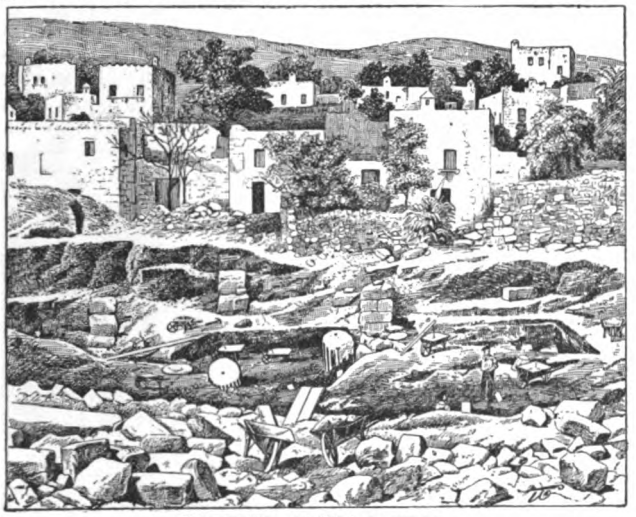
**Half-Rater.** Small racing craft, water line 15 ft., with triangular (leg-of-mutton) mainsail and jib and extra jibs. It has a centerboard. The *Ethelwynn*, winner of 1895, has beam, at water line, of 4 ft. 8 in. and draught of 6½ in. Its length over all is 23 ft. 4 in., and extreme beam 6 ft. The mainsail area is 180 sq. ft. and jib 35 sq. ft. The hull weighs ab. 350 lbs.

**Half-way Covenant.** Accepted in New England after 1657, allowing baptized and orthodox non-communicants to have their children baptized.

**Halibut.** See HETEROSOMATA.

**Haliburton,** THOMAS CHANDLER, 1796–1865. Nova Scotian judge 1829; resident in England from 1850; M. P. from 1859. His *Sam Slick*, 1837, a popular satire, had 3 more parts 1838–40–44. *American Humor*, 1852.

**Halicarnassus.** Ancient city of Caria, s.w. Asia Minor, opposite Cos; reputed birthplace of Herodotus. Its MAUSOLEUM



Excavations at Halicarnassus.

(q.v.) was erected 352 B.C. Important excavations were begun 1857 by Sir C. J. Newton, and described in his *Discoveries*, 1862.

**Halichondriæ** (SILICOSPONGIÆ). Sponges whose skeleton consists of isolated silicious spicules; sometimes also horny fibers are present. The fresh-water sponge (*Spongilla*) is an example. There are three orders: MONACTINELLIDÆ, TETRACTINELLIDÆ, and LITHISTIDÆ (q.v.).

**Halidon Hill.** In s.e. Scotland, near Berwick. Here the English defeated the Scots with heavy loss July 19, 1333.

**Halifax.** Borough of Yorkshire, 43 m. s.w. of York. It has important woolen manufactures. Pop., 1891, 82,864.

Woolshops—Halifax.

**Halifax.** Capital of Nova Scotia; founded 1749, incorporated as a city 1842; chief British naval station in N. America. It has a fine harbor and important commerce. Pop., 1891, 38,556.

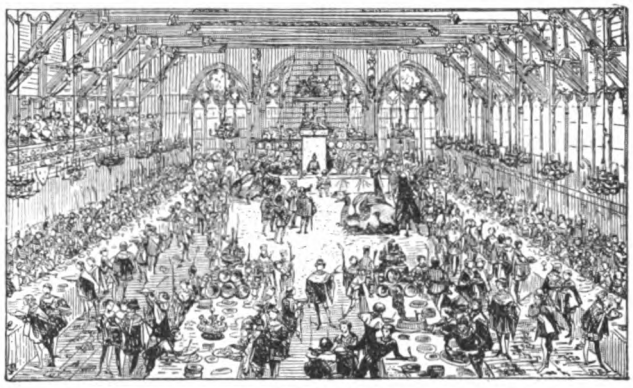
**Halifax,** CHARLES MONTAGUE, EARL OF, 1661–1715. M. P. 1688; Commissioner of the Treasury 1691; founder of the Bank of England and the national debt; Chancellor of the Exchequer 1694; Prime Minister 1697–99 and 1714; Baron 1699; impeached 1701 and 1703; Earl 1714.

**Halifax,** GEORGE SAVILE, MARQUIS OF, 1630–1695. Viscount 1668, Privy Councilor 1672, Earl 1679, Marquis 1682; Lord Privy Seal 1682–85 and 1688–89; an opportunist in statesmanship and a man of wit and high culture. *Character of a Trimmer; Miscellanies*, 1700.

**Halisarca.** Gelatinous sponge which incrusts stones; usually of a dark violet color. See MYXOSPONGIA and CARNEOSPONGIÆ.

**Halite.** NaCl. Mineralogical name of rock-salt.

**Hall.** In Mediæval domestic architecture, this was the principal apartment, and often the only public or state apartment even in costly and pretentious dwellings. It combined the uses which in modern houses are divided between the drawing-room and the dining-room, being the scene at once of assemblies and of feasts. In castles, the hall was generally raised a story above the ground, the ground floor being devoted to the guard rooms and other subordinate apartments, and the basement to dungeons, the building thus divided being the keep.



Hall in the 14th Century.

The hall was the upper story, whether the building consisted of one or more, and was immediately under the roof, the ceiling being of timberwork open to the ridge, or, in some few instances, vaulted in masonry. There was commonly a raised dais at one end, often in a bay lighted by its own window. Perhaps the finest examples remaining of the Mediæval hall are in England, as may be seen in Westminster Hall, the ruins of Kenilworth, and the older colleges of Oxford and Cambridge. The open timber roof in churches of the Gothic revival is derived rather from the secular halls than from ecclesiastical examples of the Middle Ages.

**Hall,** ANNA MARIA (FIELDING), 1804–1881. Irish novelist; wife of Samuel C. *Sketches of Irish Character*, 1829–31; *Lights and Shadows of Irish Life*, 1838; *Tales of the Irish Peasantry*, 1840.

**Hall,** ASAPH, b. 1829. Assistant at the Harvard Coll. Observatory 1857–62, and at U. S. Naval Observatory 1862–63; Prof. of Mathematics 1863. He has been connected with nearly all the eclipse expeditions sent out by the Observatory; was chief of a party for observing the transit of Venus at Vladivostock, Siberia, 1874, and again at San Antonio, Texas, 1882. In Aug. 1877 he made his most famous discovery, that of the two satellites of Mars.

**Hall,** BASIL, F.R.S., 1788–1844. Captain R.N. 1817. *Corea and Loo-Choo*, 1818; *Chili, Peru, and Mexico*, 1824; *Fragments of Voyages and Travels*, 9 vols., 1831–40; *Patchwork*, 1840. His *Travels in N. America*, 1829, caused much angry feeling.

**Hall,** CHARLES FRANCIS, 1821–1871. American explorer, in the polar regions 1860-62 and 1865–69. *Arctic Researches*, 1864. His papers afforded a *Narrative*, 1879, of his second expedition. He died in Greenland on a third voyage with the U.S.S. *Polaris*, which was abandoned 1872, the crew escaping after great hardships.

**Hall,** CHARLES HENRY, D.D., LL.D., D.C.L., 1820–1895. Rector in Brooklyn from 1869. *Protestant Ritualism*, 1871.

**Hall** (CHRISTOPHER), NEWMAN, D.D., b. 1816. Cong. pastor in London 1854–93, well known in the U. S. 1867. His tract, *Come to Jesus*, 1846, had a circulation of some 3,000,000, in more

than 20 languages. *Forum and Vatican*, 1852.—He ed. 1865 the autobiography of his father, JOHN VINE, 1774–1860, whose tract, *The Sinner's Friend*, 1836, was widely read.

**Hall,** EDWARD, 1499–1547. English historian. His *Union of Lancaster and York*, extending to 1532, was finished by R. Grafton, and pub. 1548.

**Hall,** FITZEDWARD, D.C.L.,b. 1825 in N. Y. Philologist, in India 1846-62; prof. King's Coll., London, 1862–69.

**Hall,** GRANVILLE STANLEY, LL.D., b. 1846. Prof. Johns Hopkins Univ. 1881–88; Pres. Clark Univ. 1888.

**Hall,** JAMES, 1793–1868. Writer of Western tales and sketches. *Life of Gen. W. H. Harrison*, 1836.

**Hall,** JAMES, LL.D., b. 1811. Assistant N. Y. Geological Survey 1837; author of 4 vols. on the Paleontology of N. Y.; Geologist of Iowa 1855. Among his other works are a Monograph on the Graptolites of the so-called Quebec Group of Canada, and descriptions of new species of fossils from the Niagara formation at Waldron, Indiana. *Brachiopods*, 1894.

**Hall,** JOHN, D.D., LL.D., b. 1829 in Ireland. Presb. pastor in N. Y. since 1867. *God's Word Through Preaching*, 1875.

**Hall,** JOSEPH, D.D., 1574–1656. Bp. of Exeter 1627, and Norwich 1641; imprisoned 1642, deprived 1646. His poetic *Satires*, 1597–98, were praised by Pope. *Epistles*, 1608–11; *Contemplations*, 1612–15; *Via Media*, 1622; *Old Religion*, 1628; *Hard Texts*, 1633; *Meditations*, 1640; *Episcopacy*, 1640; *New World*, 1643.

**Hall,** LYMAN, 1725–1790. M. C. from Ga. 1775–80; signer of the Declaration of Independence; Gov. of Ga. 1783.

**Hall,** MAXWELL, b. ab. 1840. Meteorological Reporter of Jamaica. Projector of an intercolonial system of telegraphic weather reports and storm warnings for the West Indies.

**Hall,** ROBERT, 1764–1831. English Baptist, counted the first preacher of his day. *Terms of Communion*, 1815; *Works*, 6 vols., 1831–33.—His son, MARSHALL, M.D., 1790–1857, was an authority on respiration and nervous diseases.

**Hall,** SAMUEL CARTER, 1801–1889. Founder of the London *Art Journal*, 1839, and its conductor till 1880; compiler of *Book of Gems*, *British Ballads*, *Baronial Halls*, and many more. He and his wife, ANNA M. (q.v.), together are said to have produced 340 volumes. *Retrospect of a Long Life*, 1883.

**Hallam,** HENRY, 1777–1859. English historian and critic of high repute. *Europe in the Middle Ages*, 1818; *Constitutional History of England*, 1827; *Introduction to the Literature of Europe in the 15th, 16th, and 17th Centuries*, 1837–39.—His son, ARTHUR HENRY, 1811–1833, is celebrated in Tennyson's *In Memoriam*. His *Remains* were pub. 1834.

**Halle.** City of Prussian Saxony, on the Saale; member of Hanseatic League ab. 1150–1300. Its university, founded 1694, suppressed 1806, united with that of Wittenberg 1817, shared with Göttingen the leadership of Protestant thought and culture in Germany, and was the first to use the German language instead of the Latin in lectures. It had in 1895 ab. 120 professors and lecturers, and 1,643 students. Pop., 1890, 101,401.

**Hallé,** SIR CHARLES, LL.D., 1819–1895. Pianist and conductor, of German birth, in Paris 1840–48; long director of the Manchester Musical Institute; knighted 1888.

**Halleck,** FITZ-GREENE, 1790–1867. American poet, noted especially for his lyrics on Bozzaris, 1825, and on J. R. Drake, with whom he wrote *The Croaker Papers*, 1819. *Fanny*, 1819–21; *Alnwick Castle*, 1827.

**Halleck,** HENRY WAGER, U.S.A., LL.D., 1815–1872. Major-gen. 1861, commanding the Dept. of the Missouri, and conducting the campaign which resulted in the capture of Corinth, Miss., May 30, 1862; General-in-chief 1862–64, directing from Washington the movements of the Federal armies; Chief of Staff 1864–65; in command of the military division of the Pacific 1865–69, and of that of the South from 1869. *Military Art and Science*, 1846; *International Law*, 1861.

**Hallel.** Ps. 113–118, chanted by Jews at the Passover.

**Hallelujah.** Hebrew word, "Praise ye Jehovah," transferred into all Christian languages.

**Haller,** ALBRECHT VON, 1708–1777. Swiss physiologist, botanist, and poet, prof. at Göttingen 1736–53; *The Alps*, 1732; *Elements of Physiology*, 8 vols., 1757–66; *Historia Stirpium Helveticæ*, 1768; *Bibliotheca Botanica*, 1771–72.

**Haller,** BERTHOLD, 1492–1536. Swiss reformer.

**Hallevi,** ELIHU BEN ASHER. See ELIAS LEVITA.

**Halley,** EDMUND, LL.D., F.R.S., 1656–1742. Director of Greenwich Observatory 1720. Among his astronomical discoveries and investigations are those of the periodicity of the comet which bears his name, the long inequality of Jupiter and Saturn, and the employment of the transit of Venus for determining the solar parallax.

**Halliards.** Corrupted from haul and yard, the ropes and tackles used to hoist or lower any sail upon its respective mast or stay.

**Halliwell-Phillips,** JAMES ORCHARD, 1820–1889. English Shakespearian. *Hist. Freemasonry*, 1842; *Dict. Provincial and Archaic Words*, 1844–45.

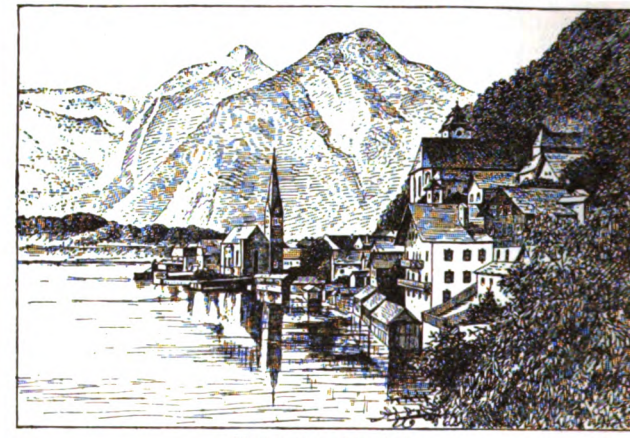
**Hall Marks.** Devices impressed by the London Company of Goldsmiths on articles of gold and silver plate after they have been assayed. Sterling gold (22 carats fine) and gold of 20 and 18 carats is marked with a crown and the respective numbers. Gold of 15, 12, and 9 carats is marked respectively .625, .5 and .375 without the crown. The silver standard of 18 dwts. alloy to the pound used from 1697–1720 was marked with a lion-passant; the other standard of 10 dwts. alloy is marked with the figure of Britannia. Other marks used are those of the assay town (London, leopard's head; Birmingham, anchor; etc.); the duty, being the sovereign's head; the date, a letter of a certain type; and the maker indicated by his initials.

**Hallock,** WILLIAM, b. ab. 1860. Prof. of Physics Columbia Coll. *Temperature; Studies in the Deep Bore at Wheeling, W. Va.*

**Halloween.** Oct. 31, eve of All Saints; associated with sundry domestic amusements and superstitions.

**Halloysite.** Amorphous, hydrous aluminium silicate, massive or earthy in appearance, allied in composition to kaolinite, a product of the decomposition of minerals containing aluminium. It is very soft and has a low specific gravity.

**Hallstatt.** Town in Upper Franconia, Bavaria, on a lake of the same name celebrated for the wild and beautiful character of its scenery. In the neighborhood are salt-mines. Pop., 1891, 3,000.



Hallstatt and its Lake.

**Hallucinations.** Subjective sensations without corresponding objective stimuli; *e.g.*, when without any corresponding auditory stimulus, voices are heard addressing one. Any of the senses may be thus deluded, especially those of sight and hearing. Hallucinations are extremely common in certain forms of insanity, but are by no means confined to that condition; persons in apparently normal health are subject to them at times. Their cause is usually an abnormal condition of the central nervous system. See ILLUSIONS.

**Halm,** KARL FELIX, 1809–1882. Prof. Munich; editor of Cicero, Tacitus, Quintilian, and other Latin authors.

**Halma.** American game played by two or four persons upon a square checkered board, with pieces or men set in the corners. The object is to occupy the opponent's place, diagonally across, by moving and jumping the pieces. Regarded as a modern invention, the counterpart of the game is a common amusement in Japan.

**Halo.** Luminous ring of white or colored mist seen encircling the heavenly bodies. When formed of concentric rings they are called Coronæ. See NIMBUS.

**Halogens.** Chlorine, bromine, iodine and fluorine; called salt producers, because by direct union with the metals they form salts.

**Haloid Salts.** Salts containing one or more of the halogens.

**Halophilous.** Plants whose natural habitat is in saline soil.

**Halophyte.** Plants which contain a considerable amount of salt, as in many sea-side species.

**Halorrhagidaceæ.** Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Dicotyledons*, comprising 9 genera and about 80 species; distributed throughout all parts of the earth; mainly aquatic in habitat: known also as *Haloragеæ*.

**Halotrichite.** $FeAl_2(SO_4)_4+24H_2O$. Feather alum (literally, hair-salt); a hydrous iron and aluminium sulphate, related to common alum in some of its properties, but differing in crystallization.

**Halpine,** CHARLES GRAHAM ("MILES O'REILLY"), 1829–1868. Irish-American journalist and poet; Brig.-gen. of Vols. 1864.

**Halrefeld.** Village near Osnabrück, Hanover; scene of Henry the Lion's victory over the vassals of Frederick I., Aug. 1180.

**Hals,** FRANZ, 1584–1666. Dutch painter, who ranks next to Rembrandt, having a coarser spirit and thought, but masterly

The Beatitudes, by Hals (The Hague).

and broad execution. His best paintings are in Haarlem. His great facility sometimes led him to be careless and sketchy.

**Halstead,** MURAT, LL.D., b. 1829. Ed. Cincinnati *Commercial*, 1856–90, and Brooklyn *Times-Union*, 1890.

**Halteres.** Posterior pair of wings of *Diptera*, reduced to small knobbed appendages; *e.g.*, the balancers of the housefly.

**Halys.** River in Asia Minor, near which the Lydians and Medes met, May 25, 585 B.C., in a battle interrupted by an eclipse of the sun.

**Ham.** Second son of Noah; supposed ancestor of the darker races.

**Hamadan.** Town of Persia, believed to be the ancient Ecbatana, 185 m. w. of Teheran. Important commercial center. It is noted for its manufactures of leather, felts, copper work, and cottons. Near by is the tomb of Avicenna. Pop. ab. 50,000.

**Hamadryads.** See NYMPHS.

**Hamah.** Ancient Syrian town, called Hamath in the Bible; conquered in turn by Assyrians, Greeks, Moslems, and Crusaders. Hittite inscriptions have been found here. Pop. ab. 45,000.

**Hamaker,** HENDRIK ARENS, 1789–1835. Prof. Leyden from 1817; writer on Oriental archæology and bibliography.

**Hamamelidaceæ.** Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Dicotyledons*, comprising 19 genera and ab. 40 species, growing both in the warm and tropical parts of Asia, Africa, and N. America; commonly called the Witchhazel family.

**Haman.** Persian magnate, whose intrigues to destroy the Jews, being frustrated by Mordecai and Esther, led to his execution.

**Hamann,** JOHANN GEORG, 1730–1788. German pamphleteer, whose influence was chiefly posthumous. His works were collected in 8 vols., 1821–43.

**Hamasah.** Collection of 884 Arabian poems in 10 books, compiled by Habib ibn Aus et Tai, whose surname was Abu Temmam. It has great value as containing many ancient legends and notices of manners and customs.

**Hamath.** Very ancient city on the Orontes, mentioned Gen. x. 18, and repeatedly in later O. T. books; named Epiphaneia by Antiochus Epiphanes; taken by Saracens 638, by Turks 1517; now Hamah. Pop. ab. 42,000.

**Hambletonian.** See HORSE.

**Hamburg.** Principal commercial city of Germany and of continental Europe, on the Elbe, 93 m. from the sea, at its junction with the Alster and Bille; terminus of several steamship lines. It was founded 808, became a free imperial city 1215, and again 1510; started 1242, with Lubeck, the Hanseatic League,

On the Alster, Hamburg.

in which it was long prominent; was unharmed in the 30 Years' War; was held by France 1810–14; joined the N. German Confederation 1866, and was merged in the empire 1871. A canal, connecting the North Sea with the Baltic, was opened here 1895. Pop., 1890, 323,923. See NORTH SEA and BALTIC CANAL.

**Hameln.** Town of Hanover, on the Weser. The legend of its piper, celebrated in Browning's poem, dates from 1284. Pop., 1890, 13,676.

**Hamerik,** ASGER, b. 1843. Danish musician, pupil of Gade, Hans von Bülow, and Berlioz; since 1871 director of the Conservatory of Music of the Peabody Institute in Baltimore; composer of four operas and numerous symphonies, suites, cantatas, etc.

**Hamerling,** ROBERT, b. 1830. Austrian poet, dramatist, and romancer; tr. Leopardi. *Ahasuerus in Rome*, 1866; *King of Zion*, 1868; *Danton and Robespierre*, 1871; *Aspasia*, 1876.

**Hamerton,** PHILIP GILBERT, 1834–1894. English artist, art critic, and essayist, mostly in France from 1859. *Painter's Camp*, 1862; *Etching*, 1866; *Unknown River*, 1870; *Intellectual Life*, 1873; *Round My House*, 1876; *Life of J. M. W. Turner*, 1879; *Landscape*, 1885; *Man in Art*, 1892. Several of his books are extracted from *The Portfolio*, which he edited from 1869.

**Hamilcar,** BARCA, d. 228 B.C. Carthaginian general, father of Hannibal. He commanded in Sicily against the Romans, in Africa against the mercenaries, and for 9 years in Spain, where he extended the empire of Carthage.

**Hamilton.** Sub-division of the American Devonian system of rocks. See DEVONIAN.

**Hamilton.** City of Ontario, Canada, at w. end of Lake Ontario; founded 1813. Pop., 1891, 48,980.

**Hamilton.** City of Butler co., Ohio, on the Miami, 25 miles n. of Cincinnati. Pop., 1890, 17,565.

**Hamilton,** ALEXANDER, 1757–1804. American statesman, b. in W. Indies; aid-de-camp to Washington 1777–81; member of the Continental Congress 1782–83 and 1787–88. He had a most important share in drawing up the Constitution, and became the first Secretary of the Treasury 1789–95, where, under circumstances of great difficulty, he proved himself one of the ablest of financiers. He was Maj.-gen. 1798–99; leader of the Federal party; killed by Burr in a duel. His papers in the *Federalist* (51 of 85) are of the highest political value. *Works*, 7 vols., 1851.

**Hamilton,** ANTHONY, COUNT, 1646–1720. Scotch-Irish Jacobite, resident mostly in France, and writing in French. *Memoirs of Gramont*, 1713, tr. 1714; *Fairy Tales*, 1805, tr. 1849.

**Hamilton,** ELIZABETH, 1758–1816. Scottish author. *Cottagers of Glenburnie*, 1808.

**Hamilton,** LADY EMMA, 1763–1815. English adventuress, wife (1791) of Sir Wm. Hamilton, ambassador at Naples; mis-

Lady Hamilton as Sensibility, by Romney.

tress of Nelson 1798. Her beauty survives in Romney's portraits.

**Hamilton,** FRANK HASTINGS, M.D., LL.D., 1813–1886. Prof. of Surgery at Buffalo 1846, Brooklyn 1858, and at Bellevue Hospital 1861–75. *Fractures and Dislocations*, 1860; *Surgery*, 1872.

**Hamilton,** LORD GEORGE FRANCIS, b. 1845. M. P. 1868; cabinet minister 1885–92 and 1895.

**Hamilton,** JAMES, 1769–1831. English teacher of languages on a method which dispensed with grammar. *Hamiltonian System*, 1829.

**Hamilton,** JAMES, 1786–1857. M.C. 1822–29; Gov. of S. C. 1830–32; prominent in Texas from 1840.

**Hamilton,** JAMES, D.D., 1814–1867. Presb. pastor in London from 1841. His *Life in Earnest*, 1844, and *Mount of Olives*, 1845, were widely read.

**Hamilton,** MOUNT. Peak in the Coast Range, s. of San Francisco Bay. Ht. 4,440 feet.

**Hamilton,** PATRICK, ab. 1503–1528. Protomartyr of the Reformation in Scotland; of the blood royal; burned as a heretic by Abp. Beaton at St. Andrews.

**Hamilton,** SCHUYLER, U.S.A., b. 1822. Grandson of Alexander; Major-gen. U. S. Vols. 1862–63. *History of the Flag*, 1852.

**Hamilton,** SIR WILLIAM, 1788–1856. Scottish philosopher University of Edinburgh, the first since Locke to give English thought a continental standing; prof. Univ. of Edinburgh from 1821. He produced elaborate contributions to the science of Logic, particularly in his doctrine of the quantification of the predicate, and a notable philosophic doctrine, his theory of the Conditioned, which was a modification of the theories of Kant, Jacobi, and Reid. He pub. editions of Reid, 1846, and Dugald Stewart, 1856. *Discussions*, 1852; *Lectures*, 4 vols., 1859–61.

**Hamilton,** SIR WILLIAM ROWAN, 1805–1865. Irish mathematician, astronomer, and physicist. Prof. Univ. Dublin 1827; knighted 1835. He introduced, with Grassman, a new method of analysis, which he expounded in *Lectures on Quaternions*, 1852, and *Elements of Quaternions*, 1866.

**Hamilton,** WILLIAM TIFFANY, 1820–1888. M.C. 1849–55; U. S. Senator 1869–75; Gov. of Md. 1880–84.

**Hamilton College.** At Clinton, N. Y.; chartered 1812; developed from the Oneida Academy, founded 1793 by S. Kirkland, long a missionary among the Oneida Indians. It had (1895) ab. 155 students and 20 instructors, a library of 34,000 vols., a law department, and an observatory.

**Hamilton Theological Seminary.** Baptist; at Hamilton, N. Y.; opened 1820, reorganized 1857; made a department of Colgate Univ 1893. It has 9 professors and 49 students (1895), and has sent out 1,185 ministers.

**Hamitic Languages.** Correlative to Semitic and Japhetic; group of African dialects, Ethiopian, Libyan, and Hottentot; not yet finally or distinctly classified.

**Hamlet.** Hero of Shakespeare's tragedy, but whether historical or mythological, or partly both, is uncertain. See SHAKESPEARE.

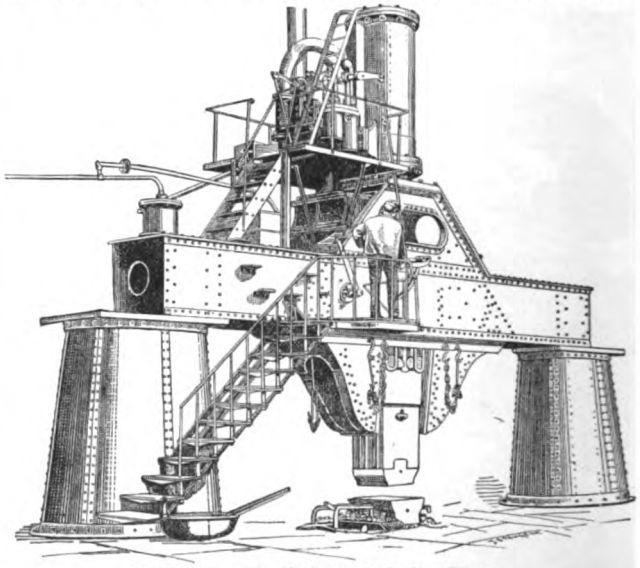
**Hamlin,** CYRUS, D.D., LL.D., b. 1811. American missionary to Turkey 1838; founder and pres. Robert Coll., Constantinople, 1860–76; pres. Middlebury Coll., Vt., 1880–85. *My Life and Times*, 1893.—His son, ALFRED DWIGHT FOSTER, b. 1855, became Prof. of Architecture in Columbia Coll. 1889.

**Hamlin,** HANNIBAL, LL.D., 1809–1891. M.C. 1843–47; U. S. Senator from Me. 1848–61 and 1869–81; Vice-Pres. 1861–65; Minister to Madrid 1881–83.

**Hamline University.** Opened 1854 at Red Wing, Minn., under M. E. control; suspended 1869; removed 1880 to St. Paul. It has 12 instructors and a preparatory department.

**Hammer,** JULIUS, 1810–1862. German poet and dramatist.

**Hammer,** STEAM. Vertical steam-engine, whose piston rod ends in the head of a hammer, for forging metals upon an anvil. The steam either acts only to lift the heavy head which drops by its own weight, or may also be admitted above the piston to give added intensity to the blow. The valve is an ordinary slide-valve, balanced entirely or in part. To enable the hammer to strike dead blows, which could not be done were the valve preopened before the blow was completed, the smaller hammers of short stroke have the valve-rod moved by a hanging cam or dangler. The dangler is held against an incline on the trip or head by the weight of the valve and rod, but the friction of these parts prevents the dangler from following the rapid descent of the ram, so that the valve is



Steam Hammer, Shultz-Knaudt Co., Essen.

opened by the swing of the dangler after the blow has been struck. To compensate for differing thicknesses of work, the dangler is mounted upon a pivot, borne at the end of the working lever, which can be adjusted by the operator for the varying thicknesses. In large hammers the dangler is not used, but the operator controls the pivot of the valve rods by his working lever, and by retarding thus the lead at the bottom of the cylinder, dead blows are secured. For shingling and blooming in rolling mills, and for some manufacturing, another class, called helve hammers, are used, driven by steam. In these a long handle or helve is pivoted on a heavy frame, and a steam cylinder is used to lift the weight of the heavy head at the end of the helve. This type is approved for die and swage work.

**Hammer,** TRIP. Form of hammer in which the helve or handle is mounted on pivots in a frame, and the weight of the head at the end of the helve is lifted by cams on a revolving shaft. The cam shaft may be behind the trunnions, and the cams may depress or trip the back end, or the cams may be between the anvil and the trunnions. Some of the newer designs give added intensity to the blow with less shock to the driving machinery by using rubber compression springs to tilt the helve. Hammers of this type are much used for die and swage work in manufacturing.

**Hammer-dressed Masonry.** Stones whose faces have been dressed with a bush hammer or patent hammer.

**Hammerfest.** Town of Norway and northernmost in Europe, in lat. 70° 38′ N. The sun remains two months above the horizon. In summer the heat is oppressive and in winter mild enough for the fishery to be carried on. Exports, fish oil, skins, walrus hides and teeth, and eiderdown. Pop., 1894, ab. 3,000.

**Hammerich,** PETER FREDERIK ADOLF, 1809–1877. Danish historian, prof. Copenhagen 1858.—His brother, MARTIN JOHANNES, 1811–1881, tr. *Sakúntala*, 1845, wrote a Life of Thorwaldsen, 1870, and much on Danish literature.

**Hammer-Purgstall,** JOSEPH, FREIHERR VON, 1774–1856. Austrian Orientalist, historian of Persian and Arabic literature; ennobled 1835.

**Hammersmith.** Suburb of London, on the Thames. Pop., 1891, 97,237.

**Hammock.** Swinging bed suspended between two supports, derived originally from the W. Indies. They have long been used in the navy, made of cloth or netting.

**Hammond,** HENRY, D.D., 1605–1660. Anglican divine and commentator. *Catechism*, 1644; *Annotations on N. T.*, 1653; *Psalms*, 1659.

**Hammond,** WILLIAM, 1719–1783. English Moravian hymnist.

**Hammond,** WILLIAM ALEXANDER, M.D., b. 1828. Surgeon-gen. U.S.A. 1862–64; prof. in New York from 1867; author of sundry professional works and several novels. *Diseases of the Nervous System*, 1871; *Lal*, 1884.

**Hamon,** JEAN LOUIS, 1821–1874. French painter.

**Hamoon.** Depression in Seistan, on the borders of Persia and Afghanistan, forming in flood time a vast shallow lake. It receives the Helmund and other rivers.

**Hampden,** SIR HENRY BOUVERIE WILLIAM BRAND, VISCOUNT, b. 1814. M. P. 1852; Liberal whip 1859–68; Speaker 1872–84; Peer 1884.

**Hampden,** JOHN, 1594–1643. M. P. 1621; imprisoned 1627, and prosecuted 1637 for resisting arbitrary taxation; leader of the opposition; one of the five members whom Charles I. attempted to arrest Jan. 4, 1642; colonel in the Parliament's army; mortally wounded at Chalgrove June 18, 1643. His loss to the cause of liberty was incalculable; he is revered as one of the purest and wisest of English patriots.

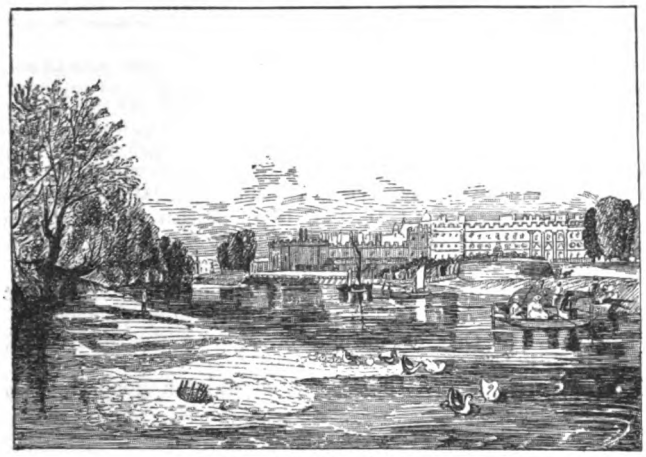
**Hampden,** RENN DICKSON, D.D., 1793–1868. Prof. Oxford 1834; Bp. of Hereford 1847. *Fathers of Greek Philosophy*, 1862.

**Hampden-Sidney College.** In Prince Edward co., Va., 70 m. w. of Richmond; founded 1775 by Presbyterians, chartered 1783. It had (1895) 8 teachers and 109 students.

**Hampole,** RICHARD ROLLE, ab. 1290–1349. English hermit and poet. *Prick of Conscience*, pub. 1863.

**Hampton,** WADE, 1754–1835. M.C. from S. C. 1795–97 and 1803–5; Brig.-gen. U.S.A. 1809, commanding at New Orleans; Maj.-gen. 1813–14, on the n. border.—His grandson, WADE, b. 1818, served in the Confederate army 1861–65, rising to Lieut.-gen. 1864, was Gov. of S. C. 1877–78, and U. S. Senator 1879–91.

**Hampton Court.** Royal palace on the Thames, 15 m. w. s.w. of London; built by Wolsey 1514 and given to Henry



Hampton Court Palace.

VIII. Here, Jan. 1604, James I. held a conference which was unfavorable to the Puritans, but led to the translation of the Bible. Now occupied by indigent persons of rank.

**Hampton Normal and Agricultural Institute.** At Hampton, Va.: chartered 1870 for the education of Negroes and Indians, unsectarian. In 1895 it employed 80 instructors and officers, and had 951 students, of whom 138 were Indians. The U. S. Government maintains 120 Indian youths here. Instruction is given in the usual English branches of the academic and lower grades, and in agriculture, cooking, carpentry, printing, blacksmithing, and various other trades.

**Hampton Roads.** In Va., at the mouth of the James, s. of Fort Monroe. Here the Confederate iron-clad *Merrimac* destroyed the Federal frigates *Cumberland* and *Congress*, March 8, 1862, and next day was compelled by the *Monitor* to retire after a four hours' fight, the first engagement between iron-clads.

**Hamster.** Rat of the Old World, with cheek pouches ab. 10 in. long. It stores up grain in underground galleries, and hibernates. It is very prolific and pugnacious, but is sometimes kept in confinement.

**Hamstrings.** Tendons behind the knee-joint, one on each side, which extend between the muscles of the back of the thigh and the leg.

**Han.** Game of the Bowl played by the ancient Egyptians, and depicted upon the monuments; apparently the same as the Greek game of tossing nuts or raisins into a vase.

**Hanaford,** PHEBE ANNE (COFFIN), b. 1829, m. 1849. First woman minister in the Universalist Ch. *Women of the Century*, 1877; *Ordination Book*, 1887.

**Hanau.** Town of Hesse-Nassau, on the Main and Kinzig; site of Napoleon's victory over the Bavarians and Austrians under Wrede, Oct. 30, 1813. Pop., 1890, 25,027.

**Hancock,** JOHN, LL.D., 1737–1793. Statesman of the Revolution, whose invectives against the royal officers after the Boston massacre led to the attempt to seize his person, and thus to the battle of Lexington. Member of the Continental Congress 1775–80 and 1785–86, its Pres. 1775–77, and the first signer of the Declaration of Independence; Gov. of Mass. 1780–85 and from 1787.

**Hancock,** WINFIELD SCOTT, U.S.A., 1824–1886. Brig.-gen. of Vols. 1861, Major-gen. 1862. Through the Civil War he served with distinguished gallantry, especially at Fredericksburg, Gettysburg, the Wilderness, and Spottsylvania. He became Brig.-gen. in the regular army 1864, and Major-gen. 1866; had command of several departments, and was Democratic candidate for Pres. 1880.

**Hand.** The terminal division of the upper extremity. All that part of the upper extremity below the bones of the forearm. Has 27 bones, muscles, a large number of tendons, nerves and blood vessels.

**Hand.** Measure of 4 in., originally the length of the palm, chiefly used in measuring horses.

**Hand Ball.** Game that had its origin, and is still most extensively played, in Ireland. For this game courts are used; in Ireland the racquet court serves as the handball court as well, and is 80 feet long by 40 feet wide. In the U. S. there are several courts devoted to hand-ball only, and these are smaller than the Irish court, being some 65 feet long and 25 feet wide. In the play a small ball is batted by the hand, and one player serves while the other returns. The ball is struck against the wall and upon its rebound from the ground is alternately batted by each of the two players until one fails to return it upon the fly or the first bound. The regulation game is 21. The game is a favorite one for putting men in condition for other athletic contests, especially boxing and the like.

**Handcuffs.** Instruments for depriving a prisoner of free movement; formerly called also manacles, swivels, and shackbolts. Until recently they were formed like the figure eight or consisted of two rings connected by a chain. Now there are other varieties known as snaps, nippers, and twisters, which are fastened to one wrist only.

**Handel,** GEORG FRIEDRICH, 1685–1759. German composer, yet one of the chief lights of English music, since his career was chiefly in London. At Hamburg he played in Keyser's orchestra and composed four German operas with Italian airs; he then spent three years in Italy, but was in England from 1710 till 1739, managing and composing Italian operas, of which he wrote 39. Financial failure following these efforts, he turned to English oratorio; his composition in this field and the instrumental have alone endured. *Esther*, 1720; *Deborah*, 1733; *Athalia*, 1733; *Saul*, 1738; *Israel in Egypt*, 1738; *Messiah*, 1741; *Samson*, 1741; *Joseph*, 1743; *Hercules*, 1744; *Belshazzar*, 1744; *Occasional Oratorio*, 1746; *Judas Maccabæus*, 1746; *Alexander Balus*, 1747; *Joshua*, 1747; *Solomon*, 1748; *Susanna*, 1748; *Theodora*, 1749; *Jephtha*, 1751; *Triumph of Time and Truth*, 1757; Te Deums, *Utrecht*, 1713, *Dettingen*, 1743.

**Handfasting.** Temporary marriage formerly customary in Scotland. The parties co-habited for a year and a day and might then separate or be finally bound in wedlock; the offspring, if any, was attached to the non-content.

**Hand-flower Tree.** *Cheirostemon platanoides.* Large tree of the natural family *Malvaceæ*, with large lobed leaves and the stamens so united as to bear some resemblance to a hand; native of c. America.

**Hand-Grenade.** Small cylindrical or ovoidal iron shell, having a plunger at one end to explode the charge on striking an object and a feathering device on the other to keep it steady in its flight after being thrown. Its principal use is against an assaulting column at close quarters.

**Hand Hole.** Opening made in a vessel which is to withstand pressure, so that an arm or hand may be inserted for inspection or repair. When large enough to allow a man's hips to pass, they are called man-holes. They are elliptical in

shape, because this causes least waste of metal, and it is possible to insert the elliptical lid from the outside after the vessel is made. The lid is put on from inside, with a gasket between the plate and the lid, and the joint is made tight by drawing up the lid by means of a nut upon a bolt or stud, the nut bearing upon a dog or bridge which spans the opening outside, and through which the stud passes from below. Hand-holes are put in the water-legs and other non-permeable places in boilers. Man-holes require a re-enforcement of the plate at the edge, and are more usually put on flat parts of the sheet. Man-holes are also put in large cylinders, condensers, and other similar vessels.

**Handicapping.** In Athletics, allowing certain starts or advantages to the various competitors in contests according to their known performances, so as to place them all on an equality. In Racing, various weights are adjudged to horses differing in age, power, or speed, with the same object.

**Hand Level.** Small level, held in the hand and having a mirror which reflects to the eye an image of the bubble; used by surveyors for rough topographical work.

**Hand of Glory.** Kind of torch or candle made of the hand with extended fingers of an executed criminal, which was believed, according to Mediæval European superstition, to be a potent instrument of magic. Referred to by Barham in one of *The Ingoldsby Legends.*

**Hangchow Foo.** City of China, at the s. end of the Imperial canal. It has an extensive trade, especially in tea and silk. When visited by Marco Polo, ab. 1300, it was much larger than now. Pop. ab. 800,000.

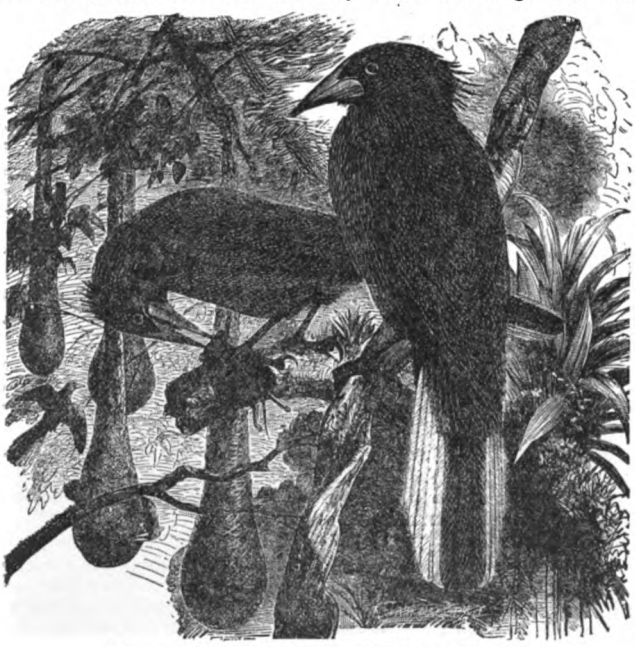
**Hangers.** Swords; also the band or strap attached to the belt or girdle and to which the sword was hung; it was often richly decorated and jeweled.

**Hangers.** Rods or plates by which the floor beams of a bridge are suspended to the trusses.

**Hanging Gardens.** Constructed in Babylon by Semiramis or Nebuchadnezzar, at a height variously stated at 75 to 300 ft.; said to have covered four acres, with a reservoir; described by Strabo and Diodorus.

**Hanging.** Capital punishment apportioned in Great Britain, Austria, and U. S. to common criminals. The law now directs that the victim shall be hanged by the neck until he is dead, but in former times he was sometimes partially hanged, revived, and hanged again. Before 1783 a cart was drawn away from under the prisoner after the rope had been attached to his neck. After that date a platform and drop was substituted. The disgraceful scenes attending public executions in England led to their abolition 1868. See EXECUTION and ELECTROCUTION.

**Hanging Nests.** Structures of various forms woven by the *Icteridæ* of America, including the Orioles, Bob-o-links, Cow-birds, and Grackles, and by some Starlings and the



Nests of the Tufted Starling (*Cassicus cristatus*).

Weaver-birds of the Old World. Sometimes the nests are open at the top and suspended by the four corners, but oftener the opening is at the side near the bottom.

**Hanging Rock.** In S. C.; scene of a victory of the Americans under Gen. Sumter over the British, Aug. 6, 1780.

**Hangings.** Cloth or tapestry necessary for comfort in the draughty Mediæval halls; also the cloth of gold and needlework used to decorate the churches.

**Hanging Wall.** Country rock lying above an inclined mineral vein.

**Hankel,** HERMANN, 1839–1873. Prof. Math. Tübingen. *Complex Numbers,* 1867; *Hist. Mathematics,* 1874.

**Han-Kiang.** River of China almost navigable from its source; but contains many rapids. Chief tributary of the Yangtse-kiang.

**Hankow.** City of China, at the junction of the Han-Kiang with the Yangtse-Kiang. It has a very large export trade, principally of tea and tobacco, and extensive manufac-

Hankow—Han-Kiang and Yangtse Confluence.

tures. It faces Hanyang City across the Han, and Wuchang across the Yangtse. The port is accessible to large ocean steamers. Pop. ab. 800,000.

**Hanley.** Town of Staffordshire, noted for manufactures of pottery. Pop., 1891, 54,846.

**Hanli.** One of the highest inhabited places in the world, on the Indus in Tibet. Elevation 15,117 ft.

**Hann,** JULIUS FERDINAND, b. 1839. Prof. Vienna; writer on meteorology.

**Hann,** LAW OF. Announced 1874 as the proper substitute for Dalton's law so far as concerns the distribution of aqueous vapor in the atmosphere; showing that the actual deposit of vapor present is scarcely one-fourth of that required by Dalton's law, and that its vertical distribution is represented by a logarithmic formula similar to that for the diminution of the pressure of the air with increasing altitude. See DALTON'S LAWS.

**Hanna,** WILLIAM, LL.D., 1808-1882. Pastor in Edinburgh 1850. *Memoir of Dr. Chalmers,* 1849–52; *Life of Christ,* 6 v., 1868.

**Hannah.** Mother of the prophet Samuel.

**Hannay,** JAMES, 1827–1873. Scottish novelist: Consul at Barcelona 1868. *King Dobbs,* 1849; *Eustace Conyers,* 1855.

**Hannibal.** City of Marion co., Mo., on the Mississippi. Pop., 1890, 12,857.

**Hannibal,** 247–ab.183 B.C. Carthaginian general, who

Hannibal.

swore eternal hostility to Rome at 9 years old; was intrusted with important military enterprises at 18, and elected com-

mander-in-chief at 26. Having subdued Spain and taken Saguntum, in 218 crossed the Alps to Italy, where he maintained himself, gaining several important victories, until in 203 he crossed over to Africa to oppose P. Scipio. He was defeated at Zama 202. Forced to flee from Carthage 193, he took refuge in Syria, then in Bithynia, and at last took poison rather than fall into the hands of the Romans. He was one of the world's greatest generals; some place him above all others.

**Hanno.** Carthaginian commander of a fleet of 60 galleys, sent out to explore and colonize the n.w. coast of Africa ab. 570 B.C. Some think they only reached Cape Nun; some make the limit the Senegal, or even the Bight of Benin. His Periplus or tablet is still extant in Greek.

**Hanoi.** Capital of Tonquin; on the Songka, eighty miles from the sea; held by the French since 1873. Pop. ab. 150,000.

**Hanoteau,** HECTOR, 1823–1890. French landscape painter.

**Hanover.** German province, anciently occupied by Saxons, who accepted Christianity and the rule of Charlemagne only after a long struggle. Under Louis the German it became part of the duchy of Saxony. When Henry the Lion lost Saxony 1182, he kept his hereditary lands of Brunswick and Lüneberg (Hanover). William, son of Ernest I., began the line of Brunswick-Lüneburg. After some subdivision by inheritance, the two duchies were reunited under George Lewis of Hanover, who ascended the English throne as George I. 1714. George II., 1727, sided with Prussia in the seven years' war. Under George III., 1760, Hanover was enriched by trade with England and America. Napoleon occupied it 1803, and incorporated it in the kingdom of Westphalia 1810. After the expulsion of the French it became a kingdom. It joined the Zollverein, 1854, and in 1866 became a province of Prussia; the interest of $12,000,000, the Guelph fund, is paid to the Hanoverian family. Pop., 1890, 2,278,361.

**Hanover.** Capital of the province, on the Leine, 107 m. s. of Hamburg. It contains colleges and learned societies, has extensive manufactures and large commerce. Pop., 1890, 165,499.

**Hanover College.** At Hanover, Ind.; chartered 1833; supervised by Presb. Synod of Indiana. The theological department, organized 1829, was moved to New Albany 1840, and later to Chicago, and is now known as the McCormick Theological Seminary. The college was opened to women in 1880. Whole number of alumni (1895) 797, instructors 14, students 160.

**Hanover Court House.** In Va.; scene of a victory of Union forces under Fitz-John Porter, May 27, 1862, over 13,000 Confederates.

**Hansard,** LUKE, 1752–1828. Printer to the House of Commons. Since 1806 the name Hansard had been given to the printed reports of the debates in Parliament.

**Hanseatic League.** Union of cities, at one time ab. 100, of n.w. Germany and the Netherlands. They protected their commerce against pirates and highway robbers by their own fleets and land forces, and made favorable treaties with sovereigns through their own representatives. Beginning 1239, the Hansa reached its greatest power ab. 1500, and was divided into four circles, of which the capitals were Lübeck, Cologne, Brunswick, and Dantzic. The cities were represented in a triennial Diet, held usually at Lübeck. For many years the Hansa ruled the Baltic and the German Ocean. It promoted trade in many ways, established factories in foreign parts, and was joined by many cities in partial alliance, but soon declined, and was dissolved 1630.

**Hansen,** FRIEDRICH VON, 12th century. German lyric poet.

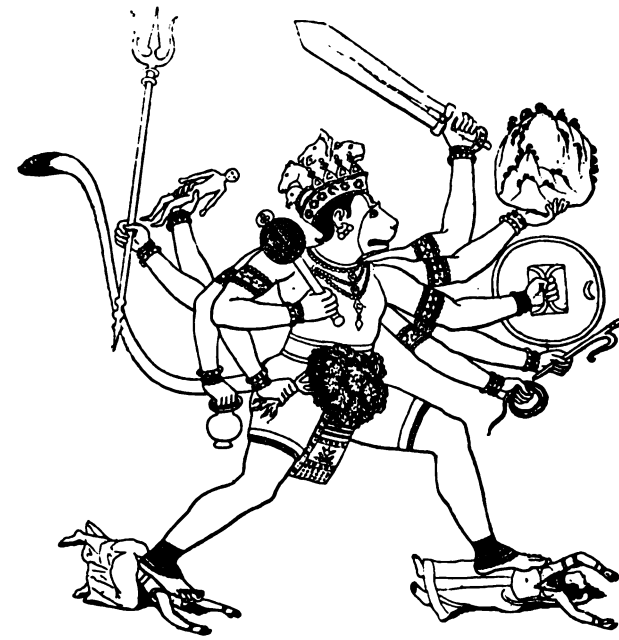
**Hansen,** HANS CHRISTIAN PETER, b. 1840. Danish critic, poet, and novelist. Tr. *Faust*, 1881–89.

**Hansen,** PETER ANDREAS, 1795–1874. Director of the Observatory at Seeburg, near Gotha, from 1825; author of many papers and memoirs in Mathemathical Astronomy, the most important being the *Tables of the Moon*, 1857.

**Hansom.** See CABS.

**Hansteen,** CHRISTOPHER, 1784–1873. Prof. Univ. Christiania 1814; author of *Researches in Terrestrial Magnetism*, 1819, and leader in the statistical study of this subject.

**Hanumant.** Monkey-faced god of the Hindu pantheon; son of Pavana, the Wind. His principal exploit was in aiding Râma, when he made his conquest of Sankâ (Ceylon), to destroy the Rakshasas and root out Sitâ and their king, Ravâna, who was carried away.



Hanumant.

**Hapalidæ.** See ARCTOPITHECINI and MARMOSETS.

**Haparanda.** Village of n.e. Sweden, on the Tornea; site of a meteorological station. Pop. 1,150.

**Haplocyta.** See GREGARINIDÆ.

**Haplodont Dentition.** Mammalian molar teeth, with simple and undivided crowns. The crown may be acute, as in the Porpoise and the *Carnivora*, or truncated, as in the Sloth.

**Haplomi.** Group of physostome fishes, including forms with abdominal pelvic fins, teeth in the jaws, and no precoracoid arch. Here belong the Blindfishes of caves (*Amblyopsidæ*), the Top-Minnows or Toothed-Minnows (*Cyprinodontidæ*), in which the sexes are so unlike as to have been frequently taken for separate species, and the Pikes (*Esocidæ*), including the Pickerel and Muskallunge. The last may attain a length of six feet or more. It differs from the Lake Pike or Pickerel in having the lower part of the cheeks scaleless. There are two common pickerels on the Atlantic slope, the larger or Green Pike, and the smaller, the Banded Pickerel.

**Haplomorpha.** 1. Division of the Nudibranchs, including the groups *Saccoglossa* and *Gymnobranchia* (*Phyllirhoë*). These are degenerated Opisthobranchs without shell, cerata, mantle, or ctenidia. 2. Group of Jellyfish, comprising the *Trachomedusæ* and *Narcomedusæ*.

**Haplonemertea.** Group of Nemertean worms, characterized by the presence of stylets on the proboscis, the absence of lateral fissures on the head, and the mouth in front of the brain. *Malacobdella* is an example.

**Haploperistomous.** Mosses, the peristome of whose sporanges bears but a single row of teeth or processes.

**Haplopola.** See MONAXONIA.

**Haplostemonous.** See ISOSTEMONOUS.

**Happiness.** Natural aim of human action; combined object of desire and interest, including all other forms of gratification.

**Hapsburg,** HOUSE OF. Imperial family of Austria; founded by Count Albert 1183, and his grandson, Albert IV., 1232. The castle of Hapsburg in Aargau was built by Werner, Bp. of Strassburg (1001–29).

**Hara Kari.** See HARI KIRI.

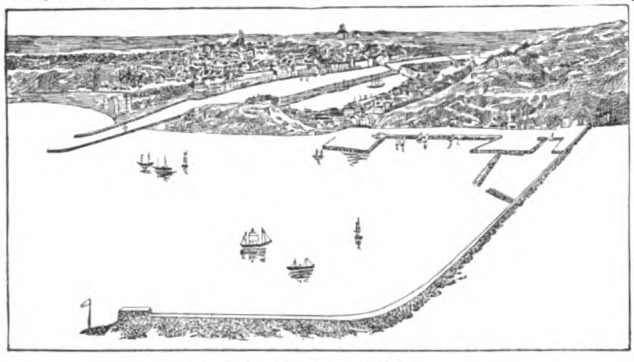
**Harar.** Fortified town in the country of the Gallas, E. Africa; chief emporium of the slave-trade. Pop. ab. 10,000.

**Harbaugh,** HENRY, D.D., 1817–1867. Prof. at Mercersburg, Pa., 1863. *Heaven*, 1848; *Fathers of the German Reformed Ch.*, 1857; *Poems*, 1860. His Penna. German verses were collected as *Harbaugh's Harfe*, 1870.

**Harbinger of Spring.** *Erigenia bulbosa.* Low, white-flowered herb of the Carrot family, native of the central U. S., blooming in early spring.

**Harbor Engineering.** Operations of dredging, construction of jetties, breakwaters, piers, and lighthouses, for the improvement of a harbor. In the U. S. this work is under the charge of the Corps of Engineers, U.S.A., and an annual appropriation of several millions of dollars is made by Congress. The aggregate of these appropriations for river and harbor improvements from 1802 to 1888 inclusive was $184,513,239.

**Harbors.** Artificial harbors are built at the mouths of rivers by the construction of jetties, breakwaters, and basins, in order to form a safe refuge for shipping. The figure gives a general view of the new harbor at Boulogne, France, which was begun in 1878. On the right is a breakwater 5,700 ft. long, forming a sheltered haven with dock landings near the shore. On the left are two small parallel jetties, forming the entrance to the inner harbor and inner basins. The cost of the jetties was $5,000,000. The inner basins of such harbors are usually



Harbor at Boulogne, France.

provided with gates which are opened only at high tide; such basins with their laterals may often accommodate hundreds of vessels.

The most important artificial harbors are those at Liverpool, London, HAVRE (q.v.), Cherbourg, and Boulogne, where the tidal range is great, and where many basins with gates are necessary. Jetty construction is employed to prevent the formation of bars near the mouth of a river. At Galveston, Texas, two jetties, having a total length of 10 miles, are under construction, the estimated cost of which is $9,000,000.

**Harcourt,** SIR WILLIAM (GEORGE GRANVILLE VENABLES) VERNON, LL.D., b. 1827. M.P. 1868; leading Liberal; knighted 1873; Solicitor-gen. 1873–74, Home Sec. 1880–85, Chancellor of the Exchequer 1886 and 1892–95. *Letters of Historicus*, 1863.

**Hardee,** WILLIAM JOSEPH, 1817–1873. Major-gen. C.S.A. 1862–65; author of *U. S. Rifle and Light Infantry Tactics*, 1856, long in use.

**Hardenberg,** KARL AUGUST, PRINCE VON, 1750–1822. Hanoverian official 1770–82; Prussian Minister of State 1791, head of the cabinet 1803–5; dismissed 1806, after Jena, as obnoxious to Napoleon; Chancellor 1810, succeeding STEIN (q.v.), whose vast scheme of reform he put into effect; Prince 1814. He bore a prominent part in the liberation of Germany, but was reactionary in later years. His memoirs were included in Ranke's *Denkwürdigkeiten*, 1877.

**Harderian Gland.** In the eyes of birds and other animals that have a nictitating membrane or Third Eyelid.

**Hardhack.** *Spiræa tomentosa.* Marsh shrub of the Rose family, native of the e. U. S.; also called Steeplebush.

**Hardicanute** (HARTHACNUT), d. 1042. Son of Canute; King of Wessex 1035, of Denmark 1036, and of England 1040.

**Harding,** CHESTER, 1792–1866. American portrait painter.

**Harding,** JAMES DUFFIELD, 1798–1863. English painter, lithographer, and writer on art.

**Harding,** JOHN, 1378–ab. 1466. English chronicler.

**Harding,** STEPHEN, d. 1134. English monk, abbot of Citeaux in France, 1110, and author of the Cistercian constitution 1119.

**Hardinge,** HENRY, VISCOUNT, 1785–1856. English officer in the Peninsular war; M.P. 1820–44; Sec. of War 1828, Sec. for Ireland 1834–35 and 1841–44; Gov.-gen. of India 1844–48; Viscount 1845; Commander-in-chief 1852, succeeding Wellington; Field-marshal 1855.

**Hard Labor.** See PRISONS.

**Hard Money.** Gold or silver coin, as opposed to paper money issued by the government or otherwise. The term has risen into common use repeatedly when there has been an agitation in favor of issuing more paper currency.

**Hardness.** A body is said to be harder than another when it cannot be abraded or scratched by the latter. It has been found convenient to form a list of 10 mineral substances of different degrees of hardness, and to express that property of any other substance by referring to its position in that scale. The standard series is due to Mohs, and is—1. Green laminated talc; 2. Crystallized gypsum; 3. Transparent calcspar; 4. Crystalline fluorspar; 5. Transparent apatite; 6. Pearly cleavable felspar (adularia); 7. Transparent quartz; 8. Transparent topaz; 9. Cleavable sapphire; 10. Diamond.

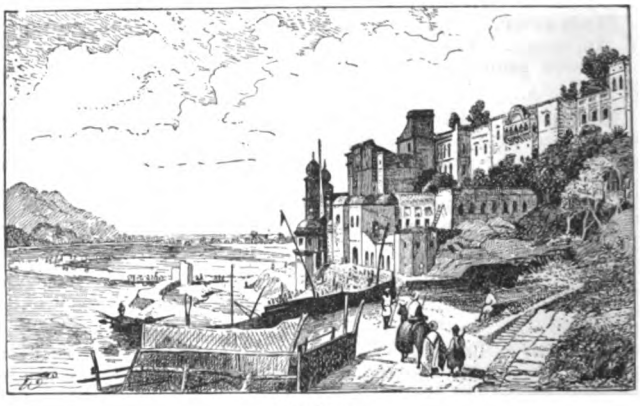
**Hardness of Water.** Due to the presence of calcium sulphate or carbonate; if the latter, it may be removed by boiling. This is called temporary hardness, in distinction from waters containing calcium sulphate, which cannot be removed by boiling.

**Hardouin,** JEAN, 1646–1729. Breton Jesuit, librarian in Paris from 1666, who questioned the genuineness of the Septuagint, the Greek Testament, and most Greek and Latin classics, as well as the historical character of the early councils; famous for learning and eccentricity. Ed. Pliny, 1685; *Prolegomena*, 1693; *Conciliorum collectio*, 12 vols., 1715.

**Hardpan.** Tenacious, compact layer beneath the surface soil, and almost impervious to water; sometimes hardened by the pressure of ice, sometimes by the presence of iron, etc. It can scarcely be broken with picks, and blasting is often necessary.

**Hardshells.** Nickname for a section of the Democratic party in N. Y. 1852–60; characterized by pro-slavery leanings; also for certain Baptists in the West and South.

**Hardwar.** Town in Gahrwal, India. The Ganges falls rapidly to the plain here and thence to its mouth falls only 1,024 ft. in 1,300 m. It is a most sacred pilgrim shrine; and at the greatest assemblies called Koombh, held every 12th year,



Hardwar.

3,000,000 pilgrims from China and Thibet to the Deccan attend to bathe in the stream. Frequent smaller festivals are also held. Pop., 1891, 29,100.

**Hardwick,** CHARLES, 1821–1859. Anglican divine; prof. at Birmingham 1853. He wrote histories of the 39 Articles, 1851, the Middle Age, 1853, and the Reformation, 1856. *Christ and Other Masters*, 1855–59.

**Hardwicke,** PHILIP YORKE, EARL OF, 1690–1764. M.P. 1719; Solicitor-gen. 1720; Attorney-gen. 1724; Chief-justice 1733; Lord High Chancellor 1737.—His son, PHILIP, M.P. 1741, 2d earl 1764, pub. *State Papers*, and *Walpoleana*, 1781.

**Hardy,** ALEXANDRE, ab. 1570–ab. 1632. French dramatist. His 41 extant plays were collected in 5 vols. 1883–84.

**Hardy,** ARTHUR SHERBURNE, Ph.D., b. 1847. American novelist; prof. in Dartmouth 1874–92, and author of several mathematical works; ed. *Cosmopolitan Mag.*, 1891–94. *Quaternions*, 1881; *But Yet a Woman*, 1883; *The Wind of Destiny*, 1886; *Passe Prose*, 1889.

**Hardy,** ROBERT SPENCE, 1803–1868. English Wesleyan, long missionary in Ceylon. He tr. a *Manual of Buddhism*, 1853. *Eastern Monachism*, 1850; *Legends and Theories of Buddhists*, 1866.

**Hardy,** THOMAS, b. 1840. English novelist of high rank but pessimistic views. *Under the Greenwood Tree*, 1872; *Far from the Madding Crowd*, 1874; *Return of the Native*, 1878; *Trumpet-Major*, 1880; *Mayor of Casterbridge*, 1886; *Woodlanders*, 1887; *Wessex Tales*, 1888; *Tess of the d'Urbervilles*, 1890; *Life's Little Ironies*, 1894. His *Jude the Obscure*, 1895, evoked severe criticism.

**Hare,** JOHN INNES CLARK, LL.D., b. 1817. Son of Robert; Judge of District Court Phila. 1851-75; Pres. Judge of Common Pleas 1875. *Law of Contracts*, 1887; *American Constitutional Law*, 1889.

**Hare,** JULIUS CHARLES, 1795-1855. Anglican divine. With his brother, AUGUSTUS WILLIAM, 1792-1834, he wrote *Guesses at Truth*, 2 vols., 1827-48. *Victory of Faith*, 1840; *Contest With Rome*, 1842; *Mission of the Comforter*, 1846; *Memoir of John Sterling*, 1848; *Vindication of Luther*, 1854.—His nephew, AUGUSTUS JOHN CUTHBERT, b. 1834 in Rome, has pub. *Walks in Rome*, 1870; *Venice*, 1884; *France*, 3 vols., 1890, and many other books of travel and description.

**Hare,** ROBERT, M.D., 1781-1858. Prof. of Chemistry in Univ. Pa. 1818-47; inventor of the oxyhydrogen blowpipe 1801, the calorimotor 1816, and other implements; advocate of electrical theories of storms and tornadoes. *Spiritualism*, 1855.

**Hare and Hounds.** Game of pursuit, in which one or two players, called Hares, start with a bag containing small pieces of paper, and drop the paper, called the Scent, as they go. The pursuers, called Hounds, follow after a fixed interval. The object of the game is the capture of the Hares, or in default of that to reach the end of the run first. It is a common English school game, and popular in the U. S., where the clubs are organized in a national association.

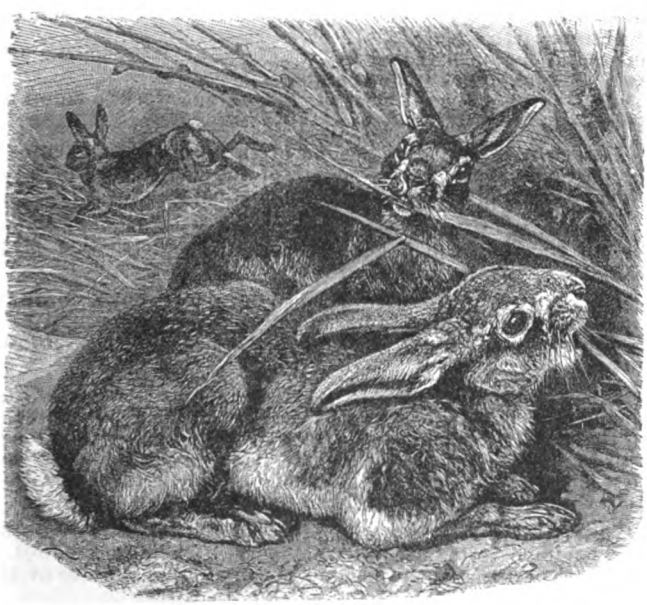
**Harebell.** *Campanula rotundifolia.* Blue-flowered plant of the natural family *Campanulaceæ*, native of the cooler parts of the northern hemisphere.

Harebell (*Campanula rotundifolia*): *a*, lower stem-leaves.

**Harelip.** Condition in which the upper lip fails to unite, as occurs normally in fœtal life. The gap may be in the middle line or on either side, and is usually accompanied by a like condition in the roof of the mouth or palate. It is usually relievable by an operation, joining the parts, best done in infancy.

**Harem.** Women's apartments in oriental houses, sacred to their privacy and that of the master; essential feature of the Mohammedan system. Female visitors are sometimes admitted. Their principal occupations are needlework, spinning, and embroidery. This institution also flourished among Babylonians and now with the Persians, Turks, Javanese, and Siamese.

**Hares and Rabbits.** Genus *Lepus*. Large lagomorphous rodents, having four incisors and twelve grinders in the upper jaw, second dentition, with incomplete clavicles, seven lumbar vertebræ, cleft nasal pad, five pairs of mammæ, large eyes, long ears and hind legs, five toes in front and four behind. The large forms are hares, the smaller are rabbits, typically represented by *L. cuniculus* of s. Europe, from which various domestic breeds have been derived. Rabbits are more proiific than hares. Northern hares turn white in winter; *L. Americanus*, widely distributed in N. America, and *L. campestris* (jack-rabbit of the West), undergo great local and seasonal variations.



Hares (*Lepus vulgaris*).

**Harfleur.** Seaport in n. France, 4 m. e. of Havre; taken by storm by Henry V. of England Sept. 22, 1415, after a siege of 36 days; now decayed. Pop. 2,317.

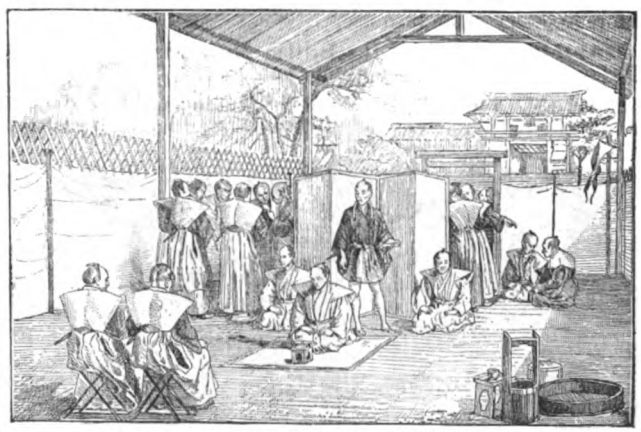
**Harfürstfiord,** BATTLE OF. Near Stavanger, Norway, 872. Harold Haarfager scattered the Norwegian fleet.

**Harger,** OSCAR, 1843-1887. Assistant geologist at Yale, where he studied the fossil *Vertebrata* brought from the West by different expeditions.

**Hargraves,** EDMUND HAMMOND, 1815-1891. English miner in Cal., 1849; discoverer of the Australian gold-fields 1851. *Australia*, 1855.

**Hargreaves,** JAMES, d. 1778. Lancashire weaver; inventor of the spinning-jenny 1766.

**Hari Kiri,** or HARA KARI. Mode of suicide formerly practiced by high officials in Japan, who were bound, after conviction of any offense, on an order from the court to rip themselves up by making two crosswise gashes in the abdomen.



Hari Kiri—Condemnation of a Noble to Suicide.

**Häring,** WILHELM ("WILIBALD ALEXIS"), 1797-1871. German novelist, noted for his historical romances. His *Walladmor*, tr. 1824, was passed off for Scott's. *Cabanis*, 1832; *The Werewolf*, 1848; *Isegrimm*, 1854.

**Hariri** (ABU MOHAMMED AL KASIM), 1054-1121. Arabic poet and grammarian. His *Makamat* (tales, mainly in verse), tr. 1850 and 1867, is very highly esteemed.

**Harivansa.** Sanskrit epic, connected with the Mahâbhârata or the Purânas.

**Harkness,** ALBERT, LL.D., b. 1822. Prof. Brown Univ. 1855; ed. Cæsar, Cicero, and sundry Greek and Latin grammars and readers.

**Harkness,** WILLIAM, LL.D., b. 1837. Astronomer; prof. U. S. Naval Observatory 1863.

**Harlamoff,** ALEXIS, b. 1844. Russian portrait painter in Paris.

**Harlan,** JAMES, b. 1820. U. S. Senator from Iowa 1855-65 and 1867-73; Sec. Interior 1865: ed. Washington *Chronicle* 1873.

**Harlan,** JOHN MARSHALL, b. 1833. Atty.-gen. of Ky. 1863-67; associate justice U. S. Supreme Court 1877.

**Harland,** HENRY ("SIDNEY LUSKA"), b. 1861. American novelist in England from 1893. *Mrs. Peixada*, 1886; *Yoke of the Thorah*, 1887; *Gray Roses*, 1896.

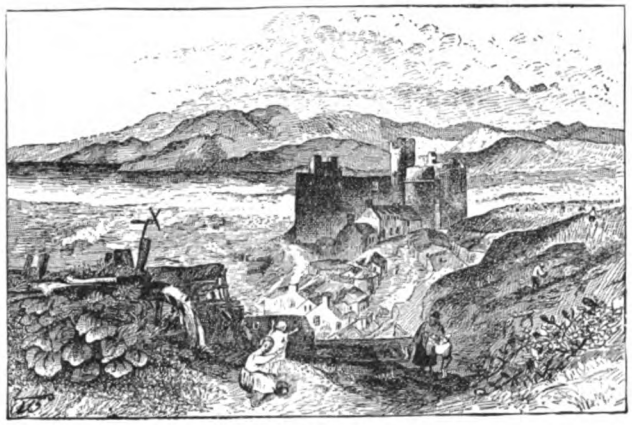
**Harland,** MARIAN. See TERHUNE, MRS. MARY V.

**Harlaw.** In Aberdeenshire; scene of a defeat of Highlanders under Donald, Lord of the Isles, by the Earl of Mar, July 24, 1411.

**Harlay,** ACHILLE DE, 1536-1616. Pres. from 1582 of the French Parliament, which he refused to convene on the de-

mand of Guise; a wise, liberal, and high-minded statesman.

**Harlech Castle.** Ancient British fort and Roman post in n. Wales. On the ruins of the old fortress Edward I. built



Harlech Castle.

the present one 1280. Its situation rendered it impregnable before artillery came into use.

**Harleian MSS.** In the British Museum; bought 1723 of Harley, Earl of Oxford; in number ab. 8,000.

**Harlem,** CORNELIS DE. 1562–1637. Dutch painter of allegorical, mythological, and historical scenes, together with portraits

The Dragon of Bœotia devouring the Companions of Cadmus, by C. de Harlem (Vienna Gallery).

and flower-pieces. They are distinguished by careful drawing from the nude and accurate foreshortening.

**Harlem Plains.** Now in New York city; scene of a British victory Sept. 16, 1776.

**Harlem River.** Connecting the Hudson with Long Island Sound, and separating Manhattan Island from the mainland; 7 m. long; converted into a ship-canal 1894–96.

**Harlequin.** Stock character or part in pantomimes, developed from a classic basis; lover of Columbine.

**Harles,** GOTTLIEB CHRISTOPH, 1738–1815. Prof. Erlangen 1770; editor of sundry classics, and of Fabricius' *Bibliotheca Græca*, 12 vols., 1790–1809.

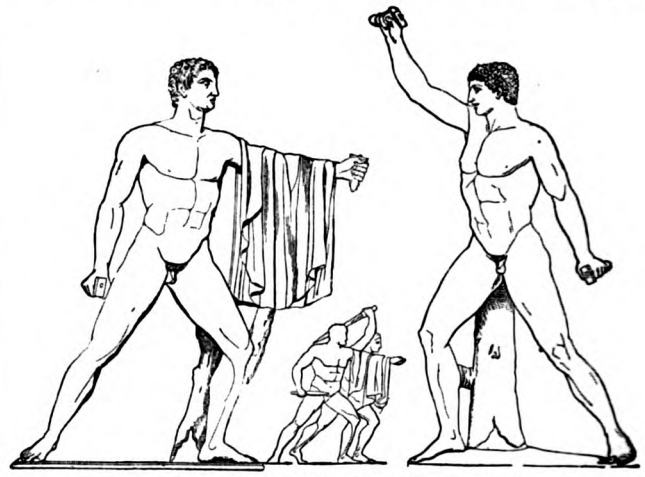
**Harless,** GOTTLOB CHRISTOPH ADOLF VON, 1806–1879. Prof. Erlangen 1833, Leipzig 1845; Pres. Consistory at Munich 1852; strict Lutheran. *Theol. Encyc. and Methodology*, 1837; *Ethics*, 1842, tr. 1868; *Jacob Böhme*, 1870.

**Harley,** ROBERT, EARL OF OXFORD, 1661–1724. M.P. 1690, Speaker 1701; Sec. of State 1704; Chancellor of the Exchequer 1710; Earl 1711; Lord High Treasurer 1711–14; impeached 1715, and imprisoned till 1817. He negotiated the Treaty of Utrecht 1713.

**Harmattan.** Periodical parching wind that blows from the interior of Africa to the Atlantic between latitudes 15° N. and 1° S. during December, January, and February.

**Harmer,** THOMAS, 1715–1788. English dissenter. *Observations on Passages of Scripture*, 4 vols., 1764–87.

**Harmodius and Aristogeiton,** d. 514 B.C. Athenian conspirators, who slew Hipparchus, but failed to reach Hippias;



Harmodius and Aristogeiton (Naples Museum).

honored as the founders of liberty in Athens, attained later under the stimulus of their example.

**Harmon,** JUDSON, b. 1846. Judge Cincinnati Superior Ct. 1878–87; U. S. Attorney-gen. 1895.

**Harmonia.** Muse, daughter of Mars and Venus, married to Cadmus. All the gods except Juno honored the nuptials with their presence and gave her a rich veil and a necklace made by Vulcan. She was changed into a serpent and placed in the Elysian Fields.

Harmonia.

**Harmonica.** Instrument for producing musical sounds by means of drinking glasses touched with the moistened fingers. Franklin greatly improved it by making the glasses rotate on a spindle set in motion by the player's foot by means of a treadle.

**Harmonica,** CHEMICAL. Musical notes produced when a glass tube, open at both ends, is held over a jet of burning hydrogen by which atmospheric pulsations are effected, as in an organ-pipe.

**Harmonic Engine.** Electro-magnetic engine invented by Edison. A tuning fork with weighted arms vibrates between electro-magnets and works a small air pump.

**Harmonic Mean.** Second of three terms in harmonic proportion. It equals the square of the geometrical mean of the extremes, divided by their arithmetical mean.

**Harmonicon.** Musical instrument with bars of wood, metal, or glass, which are beaten with mallets. See HARMONICA.

**Harmonic Pencil.** Formed by lines from a common point whose angles are in harmonic ratio. Such a pencil cuts a transversal at points whose distances are also in harmonic ratio.

**Harmonic Proportion.** Three quantities are in harmonic proportion when the first is to the third as the difference of the first and second is to the difference of the second and third. Four quantities form a harmonic proportion when the first is to the fourth as the difference of the first and second is to the difference of the third and fourth.

**Harmonic Ratio of Angles.** Three angles in sequence at a common vertex are in harmonic ratio when the product of the sines of first and third equals the product of the sine of the mean angle by the sine of the sum of the three.

**Harmonic Ratio of Points.** Four points in sequence on a straight line are distant from each other in harmonic ratio when the product of the first and third distances

equals the product of the mean distance by the sum of the three.

**Harmonics.** Component sounds which enter into the composition of any musical tone, and upon which the quality or timbre of the tone depends. Besides vibrating as a whole and producing its fundamental note, a sounding string or air-column often divides itself into halves, thirds, quarters, etc., the parts having vibration frequencies 2, 3, or 4 times that of the fundamental. It is to this phenomenon that harmonics are due, and the vibration frequency of a harmonic is always an exact multiple of that of the fundamental. Because they are constituents of the fundamental tone, Helmholz gave them the name of Partial Tones. Artificial harmonics, also called flageolet tones, are produced on the violin by lightly touching the strings at the nodal points instead of pressing them against the fingerboard.

**Harmonic Series.** One in which the terms are reciprocals of an arithmetical progression. Of any three consecutive terms, the first is to the third as the first minus the second is to the second minus the third.

**Harmonists.** Sect founded in Wurtemberg by G. Rapp; in the U. S. since 1803, and since 1824 at Economy, Pa., where they are industrious and prosperous, but few and dwindling. They were succeeded at New Harmony, Indiana, by Robert Owen.

**Harmonium.** Kind of reed-organ in which the passage of air forced from a bellows or wind-chest is partially obstructed by free reeds placed in openings in a resonating chamber. The harmonics of such an instrument usually bear to the fundamental the ratios $\frac{4}{1}$, $\frac{9}{1}$, $\frac{16}{1}$, etc.

**Harmony.** Combination of tones in chords according to rule, or the regulating system thereof. It is a characteristic element of modern European music as distinguished from ancient, savage, and Oriental, and grew up about the 10th century from the practice of permitting different voices in a choir to sing parallel melodies at the interval of a fourth, fifth, or octave.

**Harmony of the Gospels.** Story of Our Lord's life, in words of N. T., arranged in order of time; first attempted in Tatian's *Diatessaron*, ab. 170, and often since, though under certain irremovable chronological difficulties.

**Harmosts.** Officers sent out by Sparta to govern the islands and cities of Asia Minor after the Peloponnesian war.—Also, a board of oversight at Sparta, consisting of twenty members.

**Harms,** KLAUS, 1778–1855. German Lutheran, opponent of rationalism. *95 Theses*, 1817; *Pastoral Theology*, 1830.

**Harms,** LUDWIG, 1808–1865. German Lutheran pastor, promoter of missions. His training-school at Hermannsburg was carried on by his brother, THEODOR, 1819–1885, who wrote his life, 1869, and founded a Free Ch. 1877.

**Harnack,** KARL GUSTAV ADOLF, D.D., Ph.D., b. 1851 in Russia. Prof. at Giessen 1879, Marburg 1886, Berlin 1889. *History of Dogma*, 1886–90, tr. 1893; *Apostles' Creed*, 1892; *Early Christian Literature*, 1893.—His father, THEODOSIUS, 1817–1889, Prof. at Dorpat and Erlangen, pub. *Practical Theology*, 3 vols., 1877–82.

**Harness.** Egyptian and Assyrian beasts of draught and

Harness ab. 1450.

burden were most elaborately caparisoned, the leather trappings being ornamented with ivory, silver, bronze, and gold. The Greeks and Romans also delighted in rich harness, and sumptuary laws were passed to curb the excesses of luxurious equipage. In the Middle Ages the word Harness included also the armor of the war-horse, on which the highest art of the metal worker was frequently lavished. See SADDLE.

**Haro.** In Norman times a cry or formula invoking justice against violence or oppression. It was of such power that with it Asselin of Caen is said to have arrested the body of the Conqueror at his funeral till his claim was satisfied.

**Haroeris.** The elder HORUS (q.v.), brother of Osiris.

**Harold I.** (HAREFOOT) d. 1040. Son of Canute, whom he succeeded n. of the Thames 1035; King of England 1037.

**Harold II.,** d. 1066. Last Anglo-Saxon King of England; shipwrecked and a prisoner in Normandy ab. 1064, where he was forced to swear fealty to William; crowned King Jan. 10, 1066. He defeated Harold Hardrada Sept. 25, and was killed at the battle of Hastings Oct. 14.

**Harold Haarfager,** d. 933. First King of Norway; said to have kept for 20 years a vow never to clip or comb his hair till he was master of all Norway, which came about by a sea-fight 885.

**Harold Hardrada,** d. 1066. Captain of the Varangians at Constantinople; King of Norway 1047, after various exploits in the south; slain in England, while supporting the claims of Tostig.

**Haroun al Raschid,** 763–809. Caliph of Bagdad 786, famous through the Arabian Nights, which paint him too brightly. The successes of his reign were due chiefly to the Barmecides, whom he slew 803.

**Harp.** Stringed musical instrument, which existed in something like its present form in ancient Egypt. It was probably developed out of the bow, as is indicated in the oldest paintings and sculptures extant, which preserve the bow-shape, with a sounding-box at one end. As the strings grew in num-

Greek Harp and Lyres (from a fictile vase).

ber, the present triangular shape was gradually adopted. The harp is tuned diatonically in the key of C flat, but all keys are brought under command by means of pedals, which shorten the necessary strings and raise their pitch one or two semitones, as may be desired.

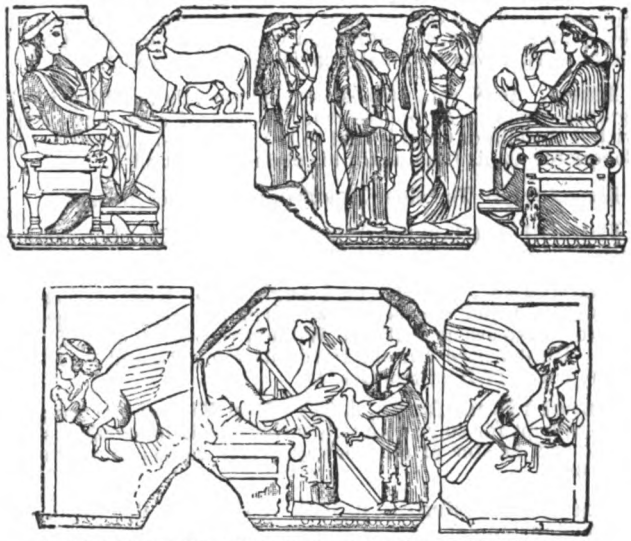
**Harper,** JAMES, 1795–1869. Founder, with his brother, JOHN, 1797–1875, of the New York publishing house 1818.—JOSEPH WESLEY, 1801–1870, and FLETCHER, 1806–1872, became members of the firm.

**Harper,** WILLIAM RAINEY, Ph.D., b. 1856. Prof. Yale 1886–91; Pres. Univ. Chicago 1891. He has done much for Hebrew studies.

**Harper's Ferry.** Village of W. Va., at the junction of the Shenandoah and Potomac; scene of John Brown's raid Oct. 1859; taken by Confederates April, 1861; Sept. 1862, with 12,000 prisoners and many guns and stores; and July, 1864. Pop., 1890, 958.

**Harpies.** Mythical birds with long claws, heads of maidens, and faces pale from hunger; sent by the gods to snatch away

or defile the food of blind Phineus.—Harpy in Heraldry is represented as a vulture with the head and breast of a woman.—



Relief from the Harpy Monument at Xanthus (British Museum).

Also, a raptorial bird of the family *Falconidæ*, which preys upon monkeys and sloths.

**Harpignies,** HENRI, b. 1819. French landscape painter.

**Harpocrates.** Egyptian divinity, represented as a child with finger on lip; hence worshiped by Greeks and Romans as god of silence.

**Harpocration.** Alexandrian Greek of uncertain date, author of a lexicon to the Ten Attic Orators.

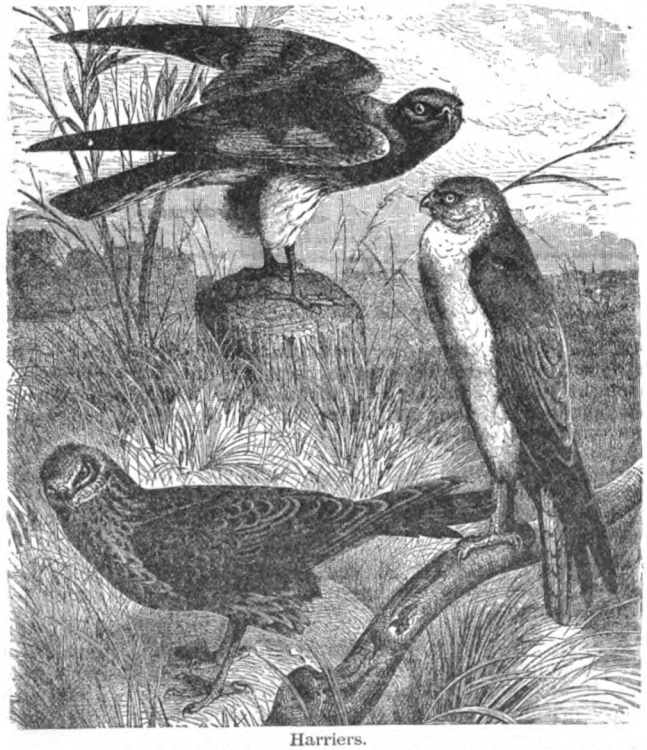
**Harpoon.** Weapon used in hunting whales and other marine animals. In its simplest form it is an iron spear ab. 5 ft. long, having a line attached and a much flattened point with two large flattened barbs. Gun-harpoons fired from small swivel guns in the whaling-boats are also used.

**Harpsichord.** See PIANOFORTE.

**Harquebus.** See CROSS-BOW.

**Harraden,** BEATRICE. English novelist. *Ships That Pass in the Night*, 1893; *In Varying Moods*, 1891.

**Harriers.** Slender falcons, with sinuate edge of bill, long legs, tarsus scutellate before and behind, toes short, claws



Harriers.

sharp, wings and tail long, face partly ruffed. The Marsh-hawk is an example. It flies with a gliding motion, nests on the ground, and feeds occasionally on poultry.

**Harrigan,** EDWARD, b. 1845. American actor, manager, and playwright, associated with Tony Hart 1871–85.

**Harrington,** JAMES, 1611–1677. English author of political romance. *Oceana*, 1656, was praised by Hume.

**Harrington,** SIR JOHN, 1561–1612. English poet. Tr. *Orlando Furioso*, 1591; *Epigrams*, 1615.

**Harrington,** MARK WALROD, b. 1848. Prof. Astronomy Univ. Mich. 1879–91; first civilian Chief of the Weather Bureau 1891–95 [after the transfer of all meteorological duties from the Chief Signal Officer, U.S.A., to the new Bureau under the Sec. of Agriculture]; founder and ed. American *Meteorological Journal*, 1884.

**Harriot,** THOMAS, 1560–1621. English mathematician. He voyaged with Raleigh to Va. 1584–85, and pub. a description 1588; he did much for the advance of algebra. *Artis Analyticæ Praxis*, 1631.

**Harris,** GEORGE, 1809–1890. English author. *Life of Hardwicke*, 1847; *Nature of Man*, 1876.

**Harris,** HOWEL, 1713–1773. Welsh evangelist. *Autobiography*, 1791.

**Harris,** ISHAM GREEN, b. 1818. M.C. 1849–53; Gov. of Tenn. 1858–62; U. S. Senator from 1877.

**Harris,** JAMES, 1709–1780. M.P. 1761. *Hermes*, 1751; *Philological Inquiries*, 1780–89.

**Harris,** JOEL CHANDLER, b. 1848. American author and journalist. In the *Uncle Remus* stories, 1880–95, he has preserved the plantation folklore of the Georgia negroes. *Mingo*, 1884; *Free Joe*, 1887; *Blue Dave*, 1888.

**Harris,** JOSEPH, 1828–1892. American agricultural editor and writer. *The Pig*, 1870; *Talks on Manures*, 1878.

**Harris,** MRS. MIRIAM (COLES), b. 1834, m. 1864. American novelist. *Rutledge*, 1860; *Roundhearts*, 1867; *Missy*, 1882.

**Harris,** ROBERT, b. 1849. Canadian painter.

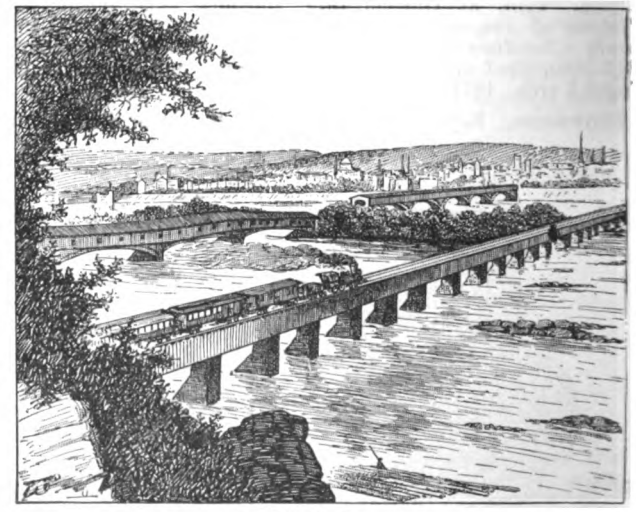
**Harris,** SAMUEL, D.D., LL.D., b. 1814. Prof. Bangor Theol. Sem. 1855; pres. Bowdoin Coll. 1867; prof. Yale 1871. *Basis of Theism*, 1883.

**Harris,** THOMAS LAKE, b. 1823 in England. Founder and head of a community at once spiritualistic and co-operative, Brotherhood of the New Life, with stations in N. Y. 1861, and later in Cal.; writer in prose and verse. His most eminent disciple was Lawrence Oliphant.

**Harris,** TOWNSEND, 1803–1878. U. S. Consul-gen., 1855–61, to Japan, with which he negotiated the commercial treaty of 1858. He procured the opening, Jan. 1, 1859, of three ports to foreigners.

**Harris,** WILLIAM TORREY, LL.D., b. 1835. Founder (1867) and ed. *Journal of Speculative Philosophy;* Supt. of Schools in St. Louis 1868–80; U. S. Com. of Education 1889. *Reports; Logic of Hegel*, 1890.

**Harrisburg.** Capital of Pa. (since 1812) and of Dauphin co., on e. bank of the Susquehanna; chartered as a borough



Harrisburg.

1791, as a city 1860. Its manufactures are principally of iron and steel. Pop., 1890, 39,385.

**Harrison,** BENJAMIN, LL.D., b. 1833. Twenty-third Pres. U. S.; grandson of Pres. Wm. H.; Col. 70th Ind. Vols. 1862–65; Reporter Ind. Supreme Court 1865–69; candidate for Gov. 1876; U. S. Senator 1881–87; Pres. 1889–93, defeating Cleveland, who

defeated him in the election of 1892.—His great-grandfather, BENJAMIN, ab. 1740–1791, was a leading Va. patriot, in Congress 1774–77, signer of the Declaration of Independence, Speaker of the House of Burgesses 1777–81, and Gov. of Va. 1781–85.

**Harrison,** CARTER HENRY, 1825–1893. M. C. from Ill. 1875–79; repeatedly Mayor of Chicago; murdered by an anarchist while in office.

**Harrison,** CONSTANCE (CARY), b. 1836 in Va., m. 1867. Novelist. *Goldenrod*, 1878; *Helen Troy*, 1881; *Anglomaniacs*, 1889; *Belhaven Tales*, 1892; *Sweet Bells out of Tune*, 1893; *An Errant Wooing*, 1895.

**Harrison,** FREDERIC, b. 1831. English positivist, tr. of Comte 1875, prof. of law at Lincoln's Inn 1877–89. *Meaning of History*, 1862; *Order and Progress*, 1875; *Choice of Books*, 1886; *Cromwell*, 1888; *Early Victorian Literature*, 1896.

**Harrison,** JOHN, 1693–1776. English inventor of the grid-iron pendulum for clocks 1725, and of the chronometer for determining longitude 1736–59. The latter won a government prize of £20,000, offered 1714.

**Harrison,** MRS. MARY ("LUCAS MALET"), b. 18 . English novelist, daughter of Charles Kingsley. *Mrs. Lorimer*, 1882; *Col. Enderby's Wife*, 1885; *A Counsel of Perfection*, 1888; *Wages of Sin*, 1895.

**Harrison,** THOMAS, 1606–1660. One of the judges of Charles I.; executed.

**Harrison,** THOMAS ALEXANDER, b. 1853. American painter, resident in Paris.

**Harrison,** WILLIAM, d. 1593. Canon of Windsor 1586; author of the *Description of England* and that of *Britain* in Holinshed's *Chronicles*, 1577.

**Harrison,** WILLIAM HENRY, 1773–1841. Ninth Pres. U. S.; M.C. 1799–1800 and 1816–19; prominent in Indian wars, and in that of 1812; Gov. of Indiana Territory 1800–13; victorious over Tecumseh at Tippecanoe, Ind., Nov. 7, 1811, and as Major-gen. U.S.A. over the British at the Thames, Canada, Oct. 5, 1813; U. S. Senator 1825–28; Minister to Colombia 1828–29; farmer in Ohio; elected Pres. 1840, after the "Log cabin and hard cider" campaign, and served March 4–April 4, 1841.

**Harrogate.** Celebrated English inland watering-place in Yorkshire, frequented for its cold springs since 1580. It has sulphur, chalybeate, and saline waters. The waters are used

The Stray, Harrogate.

both externally and internally, and are in great repute in many diseases of the skin, rheumatism, and scrofula. Pop., 1891, 13,900.

**Harrow.** Implement of tillage, consisting of a frame with numerous small sharp teeth, that pulverize without turning the surface of the soil. There is a great variety of forms in use, differing in the shape of the frame and in the number, size, form, and action of the teeth. The spring-tooth harrow is one of the most efficient forms.

**Harrow School.** Ten miles n.w. of London; founded 1571, opened in 1611: modeled mostly after Eton. It has ab. 600 students.

**Harry,** BLIND. Last of the Scottish minstrels. His *Wallace*, ab. 1488, was pub. 1570 or earlier, and often since.

**Hart,** ALBERT BUSHNELL, b. 1854. Prof. Harvard; writer on American history.

**Hart,** ANTHONY CANNON, 1857–1891. American actor.

**Hart,** EDWARD, Ph.D., b. 1854. Prof. Lafayette Coll. since 1881; Ed. *Jour. of Analytical Chemistry*, 1887–92; Ed. *Jour. Am. Chem. Soc.*, 1893.

**Hart,** JAMES MCDOUGAL, N.A., b. 1828, and WILLIAM, N.A., 1823–1894. American landscape painters, brothers, b. in Scotland.

**Hart,** JOEL T., 1810–1877. American sculptor.

**Hart,** JOHN, 1708–1780. Congressman from N. J. 1774–77; signer of the Declaration of Independence; chairman N. J. Council of Safety 1777–78; a sufferer during the British invasion.

**Hart,** JOSEPH, 1712–1768. English hymnist.

**Hart,** SOLOMON ALEXANDER, R.A., 1806–1881. English painter.

**Harte,** FRANCIS BRET, b. 1839. American novelist and poet, noted for his representations of California life and character among the miners; U. S. Consul at Crefeld 1878, and at Glasgow 1880–85. His *Heathen Chinee* and other dialect pieces are unsurpassed. *Condensed Novels*, 1867; *Luck of Roaring Camp*, etc., 1871; *Tales of the Argonauts*, 1875; *Maruja*, 1885; *Cruise of the Excelsior*, 1887; *A Sappho of Green Springs*, 1890; *In a Hollow of the Hills*, 1895; *Clarence*, 1895; *Two Americans*, 1896.

**Hartel,** WILHELM VON, b. 1839. Prof. Vienna 1869; ennobled 1882; writer on Homer and other classic subjects.

**Hartenstein,** GUSTAV, b. 1808. Prof. Leipzig 1836; editor of Kant and Herbart. *Metaphysik*, 1836; *Hist.-philos. Abhandlungen*, 1870.

**Hartford.** Capital of Conn., on the Conn.; settled 1635, chartered as a city 1784; sole capital 1665–1701, and since 1873; jointly with New Haven 1701–1873. It contains Trinity Coll., a theol. sem., important life and fire insurance companies, manufactories of small arms and edged tools. Pop., 1890, 53,230.

**Hartford Convention.** Assemblage of Federalist delegates held at Hartford, Conn., Dec. 15, 1814–Jan. 5, 1815. The main object was the defense of the n. e. States against what were thought to be encroachments of the other States and of the general Government; the immediate cause of the difficulties was the War of 1812, which had destroyed the prosperity of New England. Its proceedings were secret, and its designs were at the time regarded as treasonable.

**Hartford Theological Seminary.** Congregationalist; founded 1834. It had (1895) 12 professors and 50 students, and a library of ab. 65,000 vols. It offers elective and advanced courses.

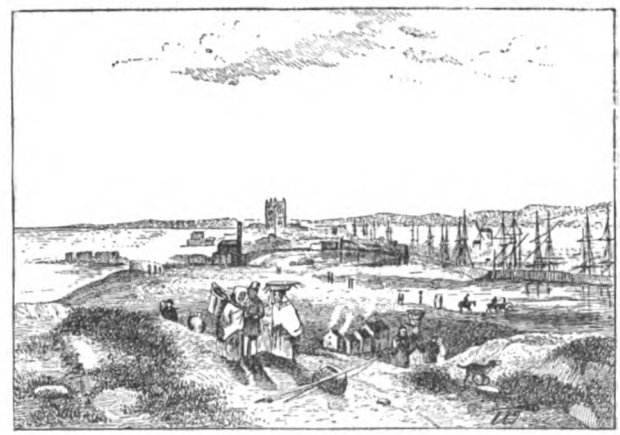
**Harthacnut.** See HARDICANUTE.

**Hartig,** GEORG LUDWIG, 1764–1836. German inspector of forests; founder 1787 of a school of forestry, attached to Univ. Berlin 1812; author of sundry books on forestry.

**Hartington,** SPENCER COMPTON CAVENDISH, LL.D., MARQUIS OF, b. 1833. M. P. 1857; member of several cabinets; Liberal leader in House of Commons 1875; Liberal-Unionist 1886; Duke of Devonshire 1891.

**Hartlaub,** CARL JOHANN GUSTAV, b. 1815. German ornithologist, writing chiefly on the birds of Africa.

**Hartlepool.** Town of Durham, Eng., on the North Sea. Its chief industries are ship building and cement manufacturing. The shipping trade is now all transferred to W. Hartle-



Hartlepool.

pool, which contains the custom house and has a good harbor. Pop., 1891, 21,521. WEST H., adjoining, was founded 1847; pop., 1891, 42,492.

**Hartley,** SIR CHARLES AUGUSTUS, b. 1825. English civil engineer, knighted 1862; employed on the Danube, the harbor of Odessa, the Suez Canal, and elsewhere.

**Hartley,** DAVID, 1705–1757. Physician and philosopher, founder of the English Associational School of Psychology. He made association the source of all abstract and complex conceptions. *Observations on Mars*, 1749.

**Hartmann,** ALFRED, b. 1814. Swiss novelist and biographer.

**Hartman,** CARL JOHAN, 1790–1849. Swedish botanist. *Skandinaviens Flora*, 1846.

**Hartmann,** JACOB, BARON VON, 1795–1873. Bavarian general, distinguished in the Franco-German war.

**Hartmann,** JULIUS VON, 1817–1878. German general, prominent in the wars of 1866 and 1870–71; Gov. of Strassburg 1871.

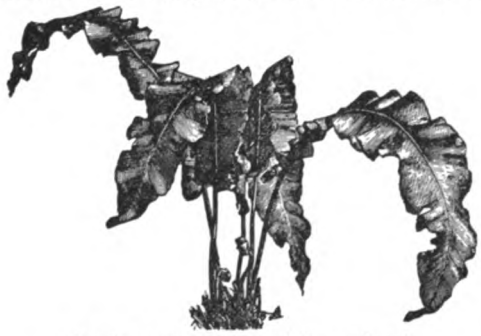
**Hartmann,** KARL ROBERT EDUARD VON, b. 1842. German philosopher, physically disabled in youth, and popularly regarded as a pessimist. His system, drawn in part from Hegel and Schopenhauer, but correcting both, aims to harmonize philosophy and science. *Philos. des Unbewussten*, 1869, tr. 1884; *Religion des Geistes*, 1882; *Philos. der Gegenwart*, 1890.

**Hartmann,** MORITZ, 1821–1872. Austrian poet and novelist. *Adam and Eve*, 1851.

**Hartmann von Aue,** ab.1170–ab.1219. German poet, best in narrative. His *Der Arme Heinrich* was the basis of Longfellow's *Golden Legend*.

**Hartshorne,** HENRY, M.D., b. 1823. Prof. Univ. Pa. 1859. *Practical Medicine*, 1869.—His father, JOSEPH, 1779–1850, and brother, EDWARD, 1818–1885, were eminent physicians.

**Hart's-tongue.** *Scolopendrium vulgare.* Broad-leaved fern, abundant in n. Europe, rare in N. America. Found in



Hart's-tongue (*Scolopendrium vulgare*).

moist woods and other shady and damp situations; it is very ornamental and attains its greatest luxuriance in winter.

**Hartt,** CHARLES FREDERICK, 1840–1878. Prof. Cornell 1868; explorer of the Amazon valley; chief of Brazilian geological survey 1875. *Geology and Physical Geography of Brazil*, 1870; *Lower Amazon*, 1874.

**Hartz.** See HARZ.

**Hartzenbusch,** JUAN EUGENIO, 1806–1880. Spanish dramatist of German parentage, librarian at Madrid from 1844, Academician 1847. *Amantes de Teruel*, 1837; *Fables*, 1861.

**Harugari.** German-American society, founded 1847 in the interests of good fellowship and the German language. It has ab. 240 lodges.

**Haruspices.** Etruscan soothsayers, who interpreted the will of the gods from the entrails of victims, or taught how to avert their anger as indicated by lightning or other portentous occurrences; summoned to Rome sometimes by the Senate to advise as to prodigies; resident in Rome from the time of the Punic Wars, and consulted on matters private and public, especially by generals on going to war. Claudius instituted a college of 60 knights, which lasted till ab. 440.

**Harvard,** JOHN, 1607–1638. Puritan minister, who came to Mass. 1637, and left 300 vols. and £779 to found the college at Cambridge.

**Harvard University.** At Cambridge, Mass.; oldest institution of learning in the U. S.; opened 1638; chartered 1650. The medical school was founded 1782, that of law 1817, of theology 1819, of science 1848, of dentistry 1868. Its official connection with the State was terminated 1865. In 1896 it had in all departments 366 instructors and 2,396 students in arts and sciences. The total number in all departments was 3,600, of whom 41 were in divinity, 465 in law, and 531 in medicine. The whole number of graduates to 1890 was 16,930, of whom 11,685 gained the A.B. degree, 3,047 M.B. or M.D., 2,281 LL.B., and 504 B.D. The main library contains 334,000 vols.; all the libraries 466,410.

**Harvest Moon.** Full moon occurring nearest the autumnal equinox, when the position of the moon's orbit is such that for several successive evenings the moon rises about the time of sunset.

**Harvey,** SIR GEORGE, 1806–1876. Scottish painter, especially given to historical and national subjects; knighted 1867.

**Harvey,** MOSES, LL.D., b. 1820 in Ireland. Presb. pastor at St. John's, Newfoundland, 1852–78. *Lectures*, 1856–64; *Newfoundland*, 1883.

**Harvey,** WILLIAM, M.D., 1578–1657. Physician to Bartholomew's Hospital, London, 1609, and to James I. and

William Harvey.

Charles I. His discovery of the circulation of the blood, made ab. 1619, was set forth 1628 in a Latin treatise.

**Harvey,** WILLIAM HENRY, 1811–1866. Prof. of Botany at Dublin 1856. *British Algæ*, 1849; *Nereis Australis*, 1847–49; *Nereis Boreali-Americana*, 1858; *Flora Capensis* (with O. W. Sonder), 1859–60.

**Harvey,** WILLIAM HOPE, b. 1851 in W. Va. Author of *Coin's Financial School*, 1894.

**Harwich.** Town of England at the mouth of the Stour, 16 m. e. of Colchester. Chief port of trade with Denmark, Holland and n. Germany. Pop., 1891, 8,200.

**Harz,** or HARTZ. Range of mountains in central Germany, 56 m. long. The Brocken, the highest summit, is 3,740 ft. high. See HERCYNIAN FOREST.

**Hasden,** BOGDAN PETRICEICU, b. 1838. Roumanian poet, dramatist, historian, and lexicographer; prof. at Bucharest.

**Hasdrubal.** 1. Carthaginian general, commanding in Spain 229–221 B.C. 2. Brother of Hannibal, left by him to command in Spain and for some years matched against the two Scipios. He came to Hannibal's aid in Italy 207, and was defeated and slain on the Metaurus.

**Hase,** BENEDICT, 1780–1864. Prof. Paris from 1816; ed. Stephanus' Greek lexicon and other learned works.

**Hase,** KARL AUGUST, 1800–1890. German liberal theologian; prof. Jena 1830–83. *Hutterus Redivivus*, 1828; *Life of Jesus*, 1829, tr. 1859; *Ch. History*, 1834, tr. 1856; *Miracle Plays*, 1858, tr. 1880.

**Hasebroek,** JOHANNES PETRUS, b. 1812. Dutch poet and essayist, pastor at Amsterdam 1851–83.

**Hashish.** Resin produced from a variety of common hemp, *Cannabis indica*, when grown in a warm climate; also the leaves and seed capsules from which the resin is obtained; narcotic and intoxicant, affecting persons variously, according to temperament. It is chewed and smoked. See BHANG.

**Hasmonæans.** See ASMONÆANS and MACCABEES.

**Hassam,** CHILDE, b. 1859. American painter.

**Hassan.** Son of Ali and Fatima the daughter of Mohammed; acknowledged by the Sheahs as second of the Twelve Imams. See SHEAHS, MOHAMMEDANISM, and HOSEIN.

**Hassard,** JOHN ROSE GREENE, 1838–1888. American journalist; biographer of Abp. Hughes, 1866, and Pius IX., 1878. *Ring of the Nibelungs*, 1877.

**Hasse,** JOHANN ADOLPH, 1699–1783. German composer of Italian operas, and husband of the singer FAUSTINA (q.v.). *Sesostrate*, Naples, 1725; *Artaserse*, London, 1734.

**Hassler,** FERDINAND RUDOLPH, 1770–1843. First superintendent of U. S. Coast Survey, 1816–18 and from 1832; chief of the Bureau of Weights and Measures. *Trigonometry*, 1826; *Geometry*, 1828; *System of the Universe*, 1828; *Logarithmic Tables*, 1838.

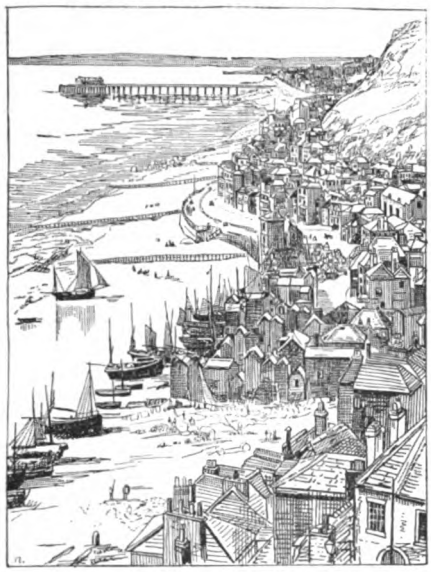
**Hassler,** SIMON, b. 1832 in Bavaria. Leader of orchestras and bands in the U. S.; composer of marches and other music.

**Hassler Expedition.** Dredging expedition sent out by the U. S. Coast Survey 1871–72, in steamer *Hassler*, around S. America to San Francisco. Louis Agassiz accompanied the expedition, but his death prevented him from publishing his report.

**Hastate.** Leaves in outline resembling an ancient halberd.

**Hastengbeck.** In Prussia; scene of a French victory July 26, 1757.

**Hastings.** Watering place in Sussex, on the English Channel, 33 m. e. of Brighton. William the Conqueror landed



Hastings and St. Leonard's, from the East Hill.

here and won the important battle, so named, near by at Senlac. The remains of an ancient castle crown the eastern of the two hills inclosing the old town. Pop., 1891, 52,340.

**Hastings.** Capital of Adams co., Nebraska. Pop., 1890, 13,584.

**Hastings,** THOMAS, Mus.Doc., 1784–1872. American hymnist, compiler, and composer of tunes. He did much to improve and popularize ch. music.—His son, THOMAS SAMUEL, D.D., LL.D., b. 1827, became prof. in Union Theol. Sem., N.Y., 1881, and its pres. 1888.

**Hastings,** WARREN, 1732–1818. English official in India 1750; first Gov.-gen. 1774–85; able and vigorous ruler; impeached for malfeasance by Burke. His trial, 1788–95, revealed the defects of the Indian system of government and called forth much splendid oratory, but resulted in his acquittal.

**Hatch,** EDWIN, D.D., 1835–1889. Anglican divine, in Canada 1857–67, and then at Oxford. His *Early Churches*, 1881, and *Growth of Ch. Institutions*, 1887, were tr. into German by Dr. A. Harnack. *Greek Influence on Christianity*, 1890.

**Hatchettite.** Natural hydrocarbon, related to paraffin, sometimes called mountain tallow or mineral adipocere, found in the Coal Measures of Great Britain.

**Hatchment.** Coat-of-arms of the deceased, in England placed in front of his house.

**Hatfield.** Small town of Hertfordshire, England, containing Hatfield House, the seat of the Marquis of Salisbury, built by Sir Robert Cecil ab. 1570. Pop., 1891, 4,500.

**Hatfield,** EDWIN FRANCIS, D.D., 1807–1883. Presb. pastor in New York 1835–63; stated clerk of General Assembly (N. S. till 1870) 1846–83; moderator 1883. *Hist. Elizabeth, N. J.*, 1868; *Ch. Hymn Book*, 1872; *Poets of the Church*, 1884.

**Hatherley,** WILLIAM PAGE WOOD, BARON, 1801–1881. M.P. 1847; Solicitor-gen. and Knight 1851; Lord Chancellor 1868–72.

**Hathor.** See ATHOR.

**Hatim,** ab. 600. Arabian chief, famed in the Orient for generosity.

**Hatred.** Settled feeling of anger or ill-will against another.

**Hats.** Head-coverings, differing from caps or bonnets only in having a brim. They were used by the ancient Greeks, and hung down the back by a band when not needed by the weather. The Romans also wore them when traveling. They were not used in w. Europe till the twelfth century; beaver hats are first mentioned ab. 1260, and hats with ostrich plumes are noticed by Froissart ab. 1340. Felt and beaver hats then became general as a mark of rank and distinction. Fifteenth-century hats had very high and steeple-like crowns, with broad, pointed, or turned-up brims, with tall plumes sometimes jeweled along the stems. They were often made of taffeta, velvet, and sarsnet. From 1500 to 1560 they were low-crowned and narrow-brimmed, but both brims, and crowns increased in infinite variety under Elizabeth, and under James I. the hatbands and turned-up brims were richly jeweled. The Cavalier hat was noticeable for its wide brim and heavy plumes; the Puritan

Hats (1500–1550).

wore his plain with broad brim and sugar-loaf crown. The size of the brim led to its being looped up and brought about the various fashionable cocks of the eighteenth century. Silk began to supersede beaver ab. 1820.

**Hats and Caps.** Two political parties in Sweden (1720), who agreed in their desire to be governed by the aristocracy, rather than by a king, whether with, or without, the diet.

**Hattemists.** Dutch Antinomian sect, suppressed 1733; founded by P. van Hattem, a Spinozist and Zealand pastor, deposed 1683, d. 1706.

**Hatteras,** CAPE. See CAPE HATTERAS.

**Hatteria.** See RHYNCHOCEPHALIA.

**Hatto.** Bp. of Mayence ab. 942; in Mediæval legend, and in Southey's ballad, eaten by rats for his oppression of the poor.

**Hatton,** JOHN LIPTROT, 1800–1886. English composer of operas, songs, and other music.

**Hauberk.** Tunic of ringed mail frequently enveloping the head also and reaching below the knees. It was introduced probably from Germany in the 12th century and lasted till ab. 1400.

Hauberk, 1230 (from Rheims Cathedral).

**Hauch,** JOHAN CARSTEN, 1790–1872. Norwegian dramatist, novelist, and poet, prof. Kiel 1846–48, and Copenhagen 1851. *Tiberius*, 1836; *The Alchymist*, 1836; *Robert Fulton*, 1853.

**Hauck,** MINNIE, b. 1852. American singer, heard in several lands and languages from 1868. In 1881 she became Mme. von Hesse-Wartegg.

**Hauff,** WILHELM, 1802–1827. German novelist and poet. *Lichtenstein*, 1826; *Märchen*, 1826.

**Haug,** MARTIN, 1826–1876. Prof. of Sanskrit at Munich from 1868; writer on the languages of India and Persia.

**Hauge,** HANS NIELSEN, 1771–1824. Norwegian evangelist, imprisoned 1804–14. His followers were not separatists, but in the U. S. have a synod of their own since 1846, with a theol. sem. at Red Wing, Minn., and some 14,000 members.

**Haughton,** SAMUEL, b. ab. 1830. Fellow of Trinity Coll., Dublin. *Physical Geography; Distribution of Sunshine.*

**Haul,** or VEER. Change in direction of the wind.

**Haunches.** Parts of an arch midway between the crown and the impost stones.

**Haupt,** HERMAN, b. 1817. Chief engineer of the Hoosac Tunnel 1858, and of the Northern Pacific Railway 1881–85. *Bridge Construction*, 1851; *Military Bridges*, 1862.—His son, LEWIS MUHLENBERG, b. 1844, was prof. Civil Engineering Univ.

Pa. 1870–92. *Engineering Specifications*, 1878; *The Topographer*, 1882.

**Haupt,** MORITZ, 1808–1874. Germanic and classical philologist, prof. in Leipzig and Berlin. His work was chiefly editorial and critical.

**Hauptmann,** GERHARDT, b. 1863. German dramatist. *Before Sunrise*, 1889; *Hannele*, 1893.

**Hauptmann,** MORITZ, 1792–1868. German musical theoretician and composer, prof. at the Leipzig Conservatory. *Die Natur der Harmonik und Metrik*, 1852, tr. 1888.

**Hauran.** Region e. of Jordan, containing hundreds of towns, most of them deserted, though not ruined, the doors and roofs being of black basalt.

**Hauriant.** Heraldic term used of fishes holding themselves erect on the shield.

**Hauser,** KASPAR, ab. 1812–1833. Supposed son of Charles, Grandduke of Baden; confined in infancy, and his mind kept a blank; abandoned in Nuremberg May 26, 1828, and cared for; wounded 1829, and again, mortally, Dec. 14, 1833, by "the man." His strange case attracted wide attention.

**Hausmann,** JOHANN FRIEDRICH LUDWIG, 1782–1859. German mineralogist, prof. at Göttingen, author of many important papers on mineralogy. *Handbuch der Mineralogie*, 3 vols., 1813.

**Hausmannite.** $Mn_3O_4$. Manganese oxide, crystallizing in the tetragonal system, found associated with other ores of manganese in the Harz Mountains and Thuringia.

**Hausrath,** ADOLF, D.D. ("GEORGE TAYLOR"), b. 1837. Prof. Heidelberg 1867. *Hist. N. T.*, 1873–77, tr. 1878–80; *D. F. Strauss*, 1876–78; *Arnold of Brescia*, 1891. His historical novels, *Antinous*, 1880, *Klytia*, 1883, *Jetta*, 1884, and *Elpieda*, 1888, were tr. 1883–88.

**Haussmann,** GEORGE EUGÈNE, BARON, 1809–1891. Prefect of the Seine 1853–70; beautifier of Paris, and creator of a public debt of ab. 800,000,000 francs.

**Haustellum.** Sucking proboscis in flies and butterflies.

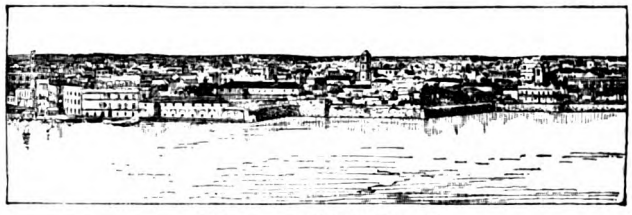
**Haustoria.** Specialized branches from the mycelium of Fungi, or from the roots of parasitic flowering plants which penetrate the living tissues of their host plants and draw nutriment from them.

**Hautboy.** See OBOE.

**Haüy,** RENÉ JUST, 1743–1822. French mineralogist, discoverer of the geometrical law of crystallization; Academician 1783. *Theory of Electricity and Magnetism*, 1787; *Mineralogy*, 1801; *Physics*, 1803; *Precious Stones*, 1817; *Crystallography*, 1822.—His brother, VALENTIN, 1746–1822, invented printing in raised letters. *Education of the Blind*, 1786; *Telegraphs*, 1810. Both were priests.

**Haüyne,** or HAÜYNITE. $2Na_2(Ca)Al_2Si_2O_8+CaSO_4$. Mineral found in the lavas of Vesuvius and other rocks of igneous origin, consisting essentially of a sodium, calcium, aluminium silicate, together with several per cent of a sodium, calcium sulphate.

**Havana.** Capital and largest city of Cuba, on the n. coast, with a fine harbor and an extensive commerce, largely



Havana, from Cabana Castillo.

in sugar and tobacco; founded 1519; captured by pirates 1528, 1555, and 1563; held by the English 1762–63; threatened by insurgents 1896. Pop., 1887, 200,448.

**Havas Agency.** Founded in Paris as a news bureau ab. 1840 by the aid of ministerial subsidies by Charles Havas (1785–1858). It was incorporated 1879.

**Havelock,** SIR HENRY, 1795–1857. English officer, long in Asia; famous for the relief of Lucknow, Sept. 25, 1857; Baronet 1857.

**Haven,** ERASTUS OTIS, D.D., LL.D., 1820–1881. Prof. Univ. Mich. 1853–56, pres. 1863–69; pres. N. W. Univ. 1869–72; M. E. Bp. 1880.

**Haven,** GILBERT, 1821–1880. Ed. *Zion's Herald*, Boston, 1867–72; M. E. Bp. 1872. He traveled much and wrote a book on Mexico 1875.

**Haven,** JOSEPH, D.D., LL.D., 1816–1874. Prof. Amherst 1858, and Chicago Theol. Sem. 1858–70. *Mental and Moral Philosophy*, 1857–59.

**Havercamp,** SIEGEBERT, 1684–1742. Dutch antiquarian and numismatist, prof. Leyden from 1721.

**Haverford College.** In Delaware co., Pa., chartered in 1856; first institution of college grade established by the Society of Friends in the U. S. It grew out of a high school founded 1832. It has a large farm, ample halls, with two observatories, chemical, mechanical, biological, and physical laboratories; a library of 32,000 vols.; 10 professors with 8 assistants; 99 students (1896); 559 graduates.

**Havergal,** FRANCES RIDLEY, 1836–1879. English hymnist and philanthropist. *Ministry of Song*, 1871; *Works*, 1884.—Her father, WILLIAM HENRY, 1793–1870, Canon of Worcester 1845, wrote many hymns and was a noted musician.

**Haverhill.** City of Essex co., Mass., on the left bank of the Merrimack River at the head of tide. The leading industries are the manufacture of shoes and hats. It was founded 1640, incorporated 1645, and chartered 1869. Pop., 1890, 27,412.

**Havers,** CLOPTON. Physician of London, discoverer of the Haversian canals for the blood-vessels in bones. His *Osteologia Nova*, 1691, was long used.

**Haversack.** Soldier's knapsack containing personal necessaries for active service.

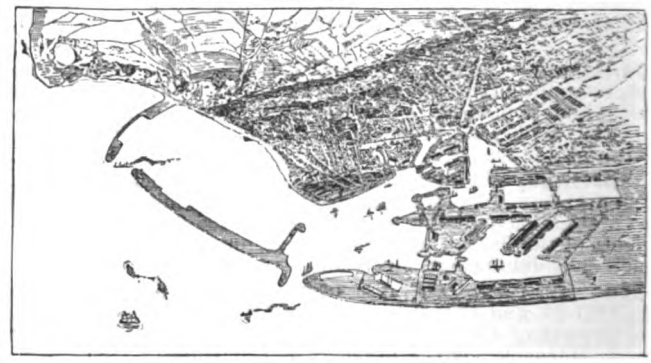
**Haverschmidt,** FRANCIS ("PIET PAALTGENS"), b. 1835. Dutch poet, pastor at Schiedam 1864.

**Havet,** PIERRE ANTOINE LOUIS, b. 1849. Prof. Coll. of France; writer on Latin grammar and versification.

**Havilah.** Unknown gold-producing region, mentioned Gen. ii. 11.

**Havildar.** Non-commissioned officer of native troops in India.

**Havre,** or HAVRE DE GRACE. Town at the mouth of the Seine; second in importance of the seaports of France; ter-

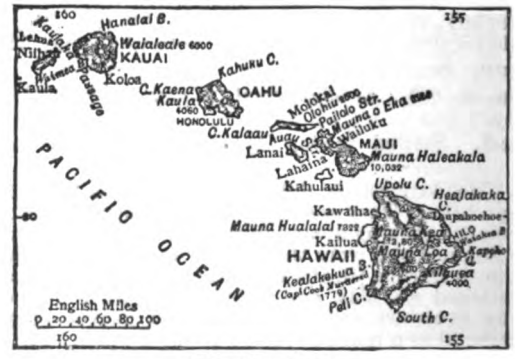


Havre.

minus of several lines of steamers, famous for its harbor and wet and dry docks; attacked by the English 1694, bombarded 1759 and 1798; blockaded Sept. 1803. Pop., 1891, 116,369.

**Haw,** BLACK. *Viburnum prunifolium*. Generally known as Nannyberry; shrub or small tree, native of e. N. America.

**Hawaiian** (or SANDWICH) **Islands.** In the Pacific; lat. 19°–23° N., long. 155°–162° W.; discovered by Gaetano 1542; rediscovered 1778 by Cook, who gave them the name Owhyhee; ruled by Kamehameha I. 1790–1819. Idolatry was nominally abolished 1819; the American missionaries came 1820. A con-




Hawaiian Islands.

stitution was granted 1840, and a more liberal one 1887. Liliuokalani, queen from Jan. 1891, attempted to regain certain of the royal prerogatives, and was deposed Jan. 17, 1893. The

provisional government vainly attempted to secure annexation to the U. S.

**Hawarden.** Town in n. Wales, near Chester. Here is Hawarden Castle, the home of Gladstone. Pop. ab. 9,000.

**Haweis,** HUGH REGINALD, b. 1838. English author and liberal preacher. *Music and Morals*, 1871; *American Humorists*, 1883; *Christ and Christianity*, 5 vols., 1886–89.—His wife, MARY ELIZA (JOY), has pub. *Chaucer for Children*, 1876; *Art of Beauty*, 1877; *Beautiful Houses*, 1882.

**Haweis,** THOMAS, M.D., 1732-1820. English hymnist. *Hist. Ch.*, 1800.

**Hawes,** STEPHEN. English allegorical poet. *Pastime of Pleasure*, 1516.

**Hawkbit.** See DANDELION, FALL.

**Hawke,** EDWARD, LORD, 1705–1781. English admiral, M.P. and Knight 1747, Baron 1776. He defeated a French fleet off Cape Finisterre Oct. 14, 1747, and another at Quiberon Nov. 20, 1759.

**Hawker,** MARY ("LANOE FALCONER"). English novelist. *Mlle. Ixe*, 1893.

**Hawker,** ROBERT, 1753–1827. Vicar of Plymouth from 1784. *Commentary*, 1816–22; from this his long-familiar *Morning and Evening Portion* was selected. *Works*, 10 vols., 1831. —His grandson, ROBERT STEPHEN, 1804–1873, Vicar of Morwenstow, Cornwall, from 1834, pub. *Ecclesia*, 1840, *Cornish Ballads*, 1869, and other poems.

**Hawkers.** Originally people who went from place to place buying and selling brass, pewter and other merchandise which ought to be uttered in open market; now synonymous with peddlers.

**Hawkesworth,** JOHN, LL.D., 1715–1773. English essayist; ed. *Adventurer*, 1752–54, and author of half its 140 numbers; ed. Swift, 1765–66; tr. *Telemachus*, 1768. *Zimri*, an oratorio, 1760; *Almoran and Hamet*, 1761; *Voyages*, 1773.

**Hawkins,** ANTHONY HOPE, b. 1863. English novelist. *Prisoner of Zenda*, 1894; *Dolly Dialogues*, 1895; *Count Antonio*, 1896; *Comedies of Courtship*, 1896.

**Hawkins,** BENJAMIN, 1754–1816. U. S. Senator from N. C. 1789–95; Indian agent for the South from 1789.

**Hawkins,** BENJAMIN WATERHOUSE, 1807-1889. English anatomist in the U. S. from 1868. He wrote much on the structure of animals. He made restorations of fossil animals for Crystal Palace, near London.

**Hawkins,** SIR JOHN, 1532–1595. English navigator, engaged in the slave-trade 1562–68; made Vice-admiral, and knighted for services against the Spanish Armada 1588.—His son, SIR RICHARD, ab. 1562–1622, emulated his exploits, was captured in S. America 1594, held a prisoner till 1602, and knighted 1603.

**Hawkins,** SIR JOHN, 1719–1789. Descendant of the naval hero; knighted 1772; author of an important *History of Music*, 5 vols., 1776, and a *Life of Dr. Johnson*, 1787.—His son, JOHN SIDNEY, 1757–1842, and daughter, LÆTITIA MATILDA, were versatile writers.

**Hawk-Moth.** See SPHINGINA.

**Hawks.** Members of the Falcon family, having the upper mandible not toothed, and the wings short, rounded, and concave below. They do not easily soar or glide. See HENHAWKS and FALCONS.

**Hawks,** FRANCIS LISTER, D.D., LL.D., 1798–1866. Rector in N. Y., N. Orleans, and Baltimore; thrice chosen P. E. bishop, but declined. *Contributions to Eccles. Hist. U. S.*, 1836–40; *History of N. C.*, 1857.—His brother, CICERO STEPHEN, D.D., 1812–1868, was P. E. Bp. of Mo. from 1844.

**Hawksbee,** or **Hauksbee,** FRANCIS, F.R.S., d. ab. 1713. English pioneer in electricity. *Physico-Mechanical Experiments*, 1709.

**Hawkshaw,** JOHN, F.R.S., 1811–1891. Civil engineer, designer of sewage systems in London and other cities.

**Hawkweed.** Plants of the genus *Hieracium;* yellow-flowered herbs of the Composite family, of wide geographical distribution.

**Hawkwood,** SIR JOHN, d. 1394. English soldier, knighted for gallantry in France; after 1360 leader of free-lances in Italy; finally in the service of Florence.

**Hawley,** JOSEPH ROSWELL, LL.D., b. 1826. Brig.-gen. U. S. Vols. 1864–65; Gov. of Conn. 1866; ed. Hartford *Courant;* M.C. 1872–75 and 1879–81; U. S. Senator from 1881.

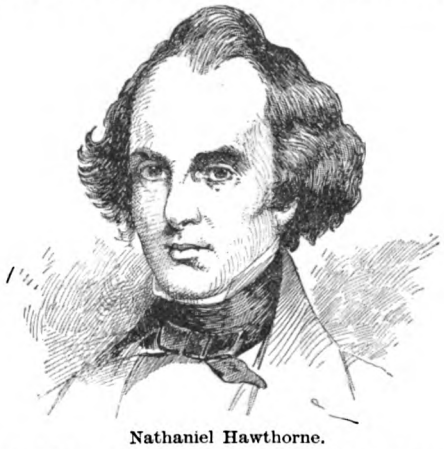
**Hawse-Holes.** Cut in a ship's bow for the cables to pass through.

**Hawser.** Rope, in size between a cable and a tow-line.

**Hawthorn.** Thorny shrubs and trees of the genus *Cratægus*, natives of the n. hemisphere; especially *C. oxyacantha*, the English Hawthorn, much planted for hedges.

**Hawthorne,** JULIAN, b. 1846. American novelist, son of Nathaniel, resident in Europe 1872–81, and now in Jamaica. *Bressant*, 1873; *Idolatry*, 1874; *Saxon Studies*, 1875; *Garth*, 1876; *Archibald Malmaison*, 1879; *Dust*, 1884; a life of his father, 1884; *Confessions and Criticisms*, 1886; *Sinfire*, 1888. *A Fool of Nature*, 1895, took the $10,000 *Herald* prize.

**Hawthorne,** NATHANIEL, 1804–1864. Foremost of American novelists. He lived at Concord, Mass., 1843–46 and 1860–64; Salem, his birthplace, as surveyor of the port, 1846–50; Lenox 1850–52; U. S. Consul at Liverpool 1853–57; then in Italy and France till 1860. His first book, *Fanshawe*, 1826, won no attention. *Twicetold Tales*, 1837–45, and *Mosses from an Old Manse*, 1846, were more successful, and *The Scarlet Letter*,



Nathaniel Hawthorne.

1850, revealed his genius at its height. In 1851 appeared *The House of Seven Gables*, *True Stories*, and *The Wonder-book*; in 1852 *The Blithedale Romance*, *Snow Image*, and *Life of Pierce*. *The Marble Faun*, 1860, was written in Italy; *Our Old Home*, 1863, referred to England. His *English*, *French*, and *Italian Note-Books*, 1868–72, were edited by his wife, SOPHIA (Peabody), 1810–1871. Other posthumous works were *Septimius Felton*, 1872, and two fragmentary romances.

**Haxo,** FRANÇOIS BENOÎT, BARON, 1774–1838. French engineer, inventor of a casemate.

**Hay.** Originally, grasses dried and cured for fodder. Since the introduction of the clovers and other forage plants, the term has been applied to them also, and even to the cereal grains, as oats and barley, when they are cut and cured before fully ripe and the whole plant used for fodder.

**Hay,** JOHN, b. 1839. American author. *Castilian Days*, 1871; *Pike County Ballads*, 1871. With John G. Nicolay he wrote the *Life of Abraham Lincoln*, 10 vols., 1887–91.

**Hay Asthma,** or HAY FEVER. Acute inflammation of the mucous membranes of the eyes, nose, throat, and bronchial tubes, causing watering of the eyes, discharge from the nose, sneezing, and cough; occurring at regular seasons each year, and believed to be due to irritation caused by the pollen of the hay-blossoms and other flowers. Some are affected by the pollen from one plant, and others by that of another. Removal, during the season of the flowering of the plant to which one is susceptible, to a locality where it is not found is the only sure method of preventing an attack.

**Hayden,** EVERETT P., b. ab. 1855. Meteorologist to U. S. Hydrographic Office; author of *Studies of Special Storms*, and of meteorological portion of the monthly *Pilot Chart*.

**Hayden,** FERDINAND VANDEVEER, M.D., LL.D., 1829–1887. Prof. of Mineralogy and Geology Univ. Pa. 1865–72; engaged 1853–78 in the exploration of the Rocky Mountain region and Laramie district, the geysers of the Yellowstone, the Tertiary lake areas of the West, and the Bad Lands of Nebraska. Much of the material that he collected has been worked out by Leidy, Meek, White, Lesquereux, and Cope.

**Hayden,** MT., or GRAND TETON. Peak in w. Wyoming, a noted landmark in early days. Altitude 13,691 ft.

**Haydn,** FRANZ JOSEPH, 1732–1809. Classic German composer, famous for all time in musical history as the perfecter of the instrumental forms (sonata, string quartet, symphony), and pioneer in the modern treatment of the orchestra. He spent the greater part of his life in the service of the princely house of Esterhazy, and left his country but twice, when he visited London, 1790–92 and 1794–95. Returning from his first visit he met Beethoven, who went to Vienna and became his pupil. Of

his compositions in all forms, a score or more of his string quartets and symphonies, his oratorios, *The Creation*, 1798, and *The Seasons*, 1801, a few of his pianoforte compositions and masses, are still on the active list. He was a voluminous composer, his symphonies and overtures numbering 125, his operas 24, string quartets 77, concertos for various instruments 117, and pianoforte solos (sonatas, etc.), 53.

**Haydn,** JOHANN MICHAEL, 1737–1806. German musician, brother of the greater Joseph; from 1762 in the service of the Abp. of Salzburg. He devoted himself chiefly to ch. music.

**Haydon,** BENJAMIN ROBERT, 1786–1846. English painter and critic, first to appreciate the Elgin Marbles, which were neglected by all other critics, 1807–15; a fine draughtsman but inferior colorist. His *Entry of Christ into Jerusalem* is in the Cincinnati Museum. *Painting and Design*, 1844–46.

Quintus Curtius, by Haydon.

**Hayes,** ISAAC ISRAEL, M.D., 1832–1881. American explorer, surgeon in Dr. Kane's Arctic Expedition, 1853–55. In 1860 he fitted out another and made important explorations along the coast of Greenland and as far n. as 81° 37′. *Arctic Boat-Journey*, 1860; *Open Polar Sea*, 1867; *Cast away in the Cold*, 1868; *Land of Desolation*, 1871.

**Hayes,** RUTHERFORD BIRCHARD, 1822–1893. Nineteenth Pres. U. S.; Brig.-gen. of Vols. 1863; M.C. 1865–67; Gov. of Ohio 1868–72 and 1876; Republican candidate for Pres. 1876; declared elected by a vote of 8 to 7 by the special Electoral Commission chosen to settle the vote in the disputed States, La., Fla., S. C., and Oregon. The special features of his administration were the conciliatory policy toward the Southern States and the impulse given to Civil Service Reform.

**Hay-Fever Weed.** See HOGWEED.

**Haygood,** ATTICUS GREENE, D.D., LL.D., b. 1839. Pres. Emory Coll., Ga., 1876–84; Bp. M. E. Ch. South 1890. *Pleas for Progress*, 1889.

**Hayley,** WILLIAM, 1745–1820. English poet. *Triumphs of Temper*, 1781; *Life of Cowper*, 1802.

**Haym,** RUDOLF, b. 1821. Prof. Halle 1868; biographer of W. von Humboldt, Hegel, Schopenhauer, and Herder.

**Haynau,** JULIUS JACOB, BARON VON, 1786–1853. Austrian general, notorious for cruelty in Hungary 1849; mobbed in London 1850.

**Hayne,** PAUL HAMILTON, 1830–1886. American poet, nephew and biographer of Robert Y.—His son, WILLIAM H., is also a poet.

**Hayne,** ROBERT YOUNG, 1791–1839. U. S. Senator 1823–32; Gov. of S. C. 1833–34; Mayor of Charleston 1835–37; advocate of Nullification. His debate with Webster, Jan. 1830, is celebrated.

**Haystack Boiler.** See BALLOON BOILER.

**Hayter,** HARRISON, b. 1825. English civil engineer, partner of Sir J. Hawkshaw 1870–88, and engaged with him in various parts of Europe and elsewhere.

**Hayti.** See HAITI.

**Hayward,** ABRAHAM, 1801–1884. English author; Q.C. 1845; founder and ed. *Law Magazine*, 1828–44. Tr. *Faust*, Part I., 1833; *Art of Dining*, 1852; *Essays*, 5 vols., 1858–73; *Mrs. Piozzi*, 1861; *Goethe*, 1877; *Whist*, 1878; *Statesmen and Writers*, 1880.

**Hazael.** King of Syria, figuring in O. T. and in Assyrian inscriptions; hostile and destructive to Israel, though a prediction of Elisha had led to his usurping the throne by the murder of his master.

**Hazard.** Game at dice of considerable antiquity, extremely popular at the present day among the lower classes in the U. S. under the name of Craps. Two dice are thrown, and their various combinations are given fanciful names, as in the somewhat similar game played in China.

**Hazel.** North of England term for a hard grit rock.

**Hazel-Nut.** Nuts yielded in England and N. America by shrubs of the genus *Corylus*, natural family *Betulaceæ;* natives of the n. hemisphere; known also as Filberts.

Hazel-Nut (*Corylus avellana*).

**Hazen,** HENRY ALLEN, b. 1850. Prof. in U. S. Weather Bureau; author of numerous papers on practical and observational meteorology.

**Hazen,** WILLIAM BABCOCK, U.S.A., 1830–1887. Successor 1880 to Gen. A. P. Myer as Chief Signal Officer U.S.A., and ex-officio in charge of the Weather Bureau.

**Hazleton.** City of Luzerne co., Pa., surrounded by coal-mines. Pop., 1890, 11,872.

**Hazlitt,** WILLIAM, 1778–1830. English essayist and critic. *Characters of Shakespeare*, 1817; *Eng. Stage*, 1818; *Poets*, 1818; *Comic Writers*, 1819; *Literature of Elizabethan Age*, 1821; *Table-Talk*, 1824; *Spirit of the Age*, 1825; *Life of Napoleon*, 1827.—His grandson, WILLIAM CAREW, b. 1834, has pub. his Memoir, 1867, a history of Venice, 1858–60, *Bibliography*, 1867, and *Popular Antiquities of Great Britain*, 1870.

**Head.** The rounded upper extremity of the body. Composed of, 1, anterior division, called face, in which most of the special senses are located; 2, posterior division, called cranium, containing the brain and its membranes. See CRANIOMETRY.

**Head.** Height of a water surface above any point subject to the pressure of the water. If h be the head in feet, the pressure in pounds per sq. inch is 0.434h. The effective head in the pipes of a water supply system should be from 150 to 300 feet. See HYDROKINETICS.

**Head.** Dense flower-cluster of the racemose type, the pedicels of the individual flowers being very short or wanting.

**Head,** BARCLAY VINCENT, Ph.D., D.C.L., b. 1844. Numismatist of the British Museum. His *Historia Nummorum*, 1887, is the leading book on Greek coins.

**Head,** SIR FRANCIS BOND, 1793–1875. English author; Lieut.-gov. of Upper Canada 1835–37, Baronet 1838. *Journey across the Pampas*, 1828; *Life of James Bruce*, 1830; *Bubbles from the Brunnen of Nassau*, 1833; *A Faggot of French Sticks*, 1851; *The Horse and his Rider*, 1861.—Of his brothers, SIR GEORGE, 1782–1875, in Canada 1814, knighted 1831, pub. *Wilds of N. America*, 1829, *Rome*, 1849, and tr. Apuleius' *Golden Ass*, 1851; SIR EDMUND WALKER, 1805–1868, Baronet 1838, Gov.-gen. of Canada 1854–61, pub. *Handbook of Spanish Painting*, 1847.

**Headache.** Pain in the head, whether limited to a small portion or general. It may be due to disease of the brain or ear, or may be an accompaniment of fevers, congestion, or anæmia of the brain, strain upon the eyes from faulty vision, disordered stomach, constipation, decayed teeth, presence of undue amounts of uric acid in the system, Bright's disease, irritation of any portion of the body, reacting upon the nervous system, alcohol, over-fatigue, and many minor causes. Rest in a darkened apartment, hot foot-baths, hot applications to the seat of the pain, abstinence from food, and a cathartic, will usually alleviate it. If persistent, the eyes should be examined by a competent person, as errors of refraction are a very common cause.

**Head Cavity.** Extensions of the body cavity into the head, as seen in embryo vertebrates.

**Headdresses.** From the walls of palaces and tombs we learn that Assyrian and Egyptian coiffures were of a most elaborate character. Greek females confined the hair with a band or net-work often richly ornamented with gold. Sometimes it was inclosed in a sort of bag of various textile materials. In mourning it was cut short. Black was the commonest color and blonde the favorite. Until the Empire the Roman women dressed the hair very simply, but varied and intricate modes were adopted under Augustus, Claudius, and Hadrian. Gold-dust was sprinkled to heighten its effect, and in distant provinces the light-haired barbarians were shorn to supply Rome and Byzantium with tresses of the fashionable tint. Norman ladies wore them long curiously braided, reaching to the ground, entwined with ribbons or encased in silken sheaths. The Crusades brought in Oriental modes with toques and turbans, and the hair was confined with fillets, veils, and gold nets during the 13th century.

Then for a time it was disposed over the ears and round the head with extreme elegance and intricacy of plait and braid, and this was followed by extraordinary muffling which concealed even brow, cheeks and chin. From 1380 to 1410 fashion adopted the escoffion, a huge pad or cushion ornamented with lace and gold beads or pearls, and the monstrous HENNIN (q.v.), worn by Isabel of Bavaria at her marriage 1385, lasted in spite of priestly censure and mob ridicule till 1470. These horns were succeeded by the curious diamond headdress of York and Lancaster with long side lappets and the architectural character of hair-structure finally disappeared.

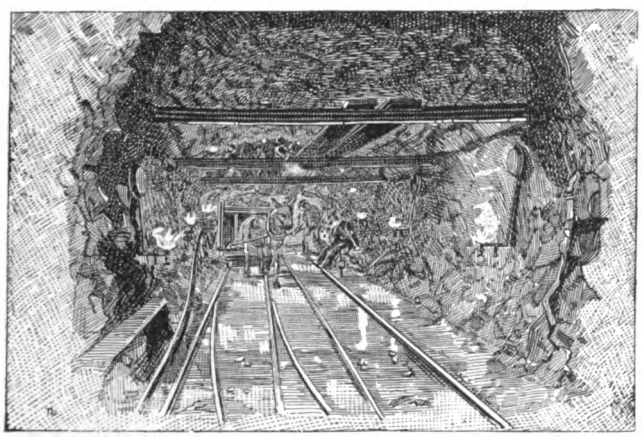
Headdresses (1660–1778).

Queen Elizabeth frizzed and most elaborately decorated her hair with jewels, ribbons, and feathers, and left an incredible number of varied wigs behind her, but it was reserved for the 18th century to far outstrip all former excesses. The hair was built up on framework to vast heights and ornamented with flowers, feathers, ribbons, laces, trinkets, chains, jewels, and even models of animals and ships. These "heads" were opened once a fortnight to remove vermin and renew the stiffening, and satire and abuse were fruitless till the rage had run its course ab. 1790, after which the taste for everything classic restored comparative simplicity.

**Header.** Stone laid in a wall with its longest dimension perpendicular to the face, and serving to bind together the stretchers. In some brick walls every fifth or sixth course is composed of headers.

**Head Fold.** Elevation of blastoderm, which first marks off the head region of the embryo animal.

**Heading.** Mining term; a drift or passage in a mine that has a horizontal or nearly horizontal direction; especially de-



Heading in new Aqueduct Tunnel, N.Y.

noting the place where the miners are at work in extending such a passage. Also applied to a cross-heading, a continuous passage for air or for use as a manway.

**Head Kidney.** 1. Pronephros or anterior part of the Wolffian body, present in embryo Vertebrates, and in some adults among fishes. 2. Kidney at the anterior end of the body cavity, as in certain fishes.

**Headley,** JOEL TYLER, b. 1813. American historical writer. *Napoleon and his Marshals*, 1846; *Washington and his Generals*, 1847; *The Adirondacks*, 1849; *The Great Rebellion*, 1864; *Grant and Sherman*, 1865; *African Explorers*, 1877.

**Head Money.** See POLL TAX.

**Head Rail.** Hood or coverchief serving the Saxon and Norman ladies as a headdress.

**Head Segments.** See CEPHALIC SEGMENTS.

**Heads,** or HEADINGS. Heavier and richer portions of ore collected nearest the upper end of sloping launders, tables, or buddles used in ore-dressing, or in the first of any series of operations arranged for a similar purpose. Compare TAILINGS.

**Heads and Tails.** The game of tossing coins is of remote antiquity and current almost everywhere coined money is used. Heads win, tails lose, is the invariable rule. In China, the obverse of the coin is called White and the reverse Black. The tossed coin appears, here at least, to be a substitute for the arrow derived stone.

**Headway.** Clear distance between the floor and the overhead bracing of a bridge. For a railroad bridge this is usually ab. 19 or 20 ft. The clear space below the bridge is called the waterway.

**Heal All.** *Prunella vulgaris.* Low herb of the Mint family, of wide geographical distribution; known also as Self Heal.

**Healing.** Restoration of an injured or diseased part to its normal condition; first intention, or primary, when the separated parts adhere and unite without formation of pus; by second intention when two granulating surfaces grow together; and by third intention when granulations from the sides and bottom fill up the cavity. In the last two the formation of pus is normal.

**Health,** BILL OF. Certificate issued by the custom authorities or consuls in a port, to captains of departing vessels, as to the existence of contagious diseases in the locality. If there are none the bill is called Clean.

**Health,** BOARDS OF. These have supervision of all subjects affecting the public health, including water supply, contagious diseases, adulteration of food, contamination of the atmosphere, noxious trades, etc. An English board was established in 1848, though London had a health officer previously. In U. S. the first State Board was established in 1868 by Mass. The National Board was established 1879. Many States now have such boards, and it has extended to city and town governments with good results.

**Health Resorts.** Besides holiday haunts by the sea, popular in all civilized nations, mineral springs and wells have been frequented since the time of the Romans and hydropathic establishments of all kinds constantly multiply. See MINERAL SPRINGS. The value of pure mountain air is a modern discovery and many invalids visit the Adirondacks and the highlands of Colorado, N. Carolina, Scotland, Austria, Norway, France, Switzerland, Germany, and Italy. The sanatoriums of India are also the hill-stations. Pulmonary subjects are sent to the mild climates of Madeira, Florida, Georgia, Algiers, Egypt, s. Italy, and the Riviera. Other localities are resorted to for the various mud and sun baths, milk and grape cures.

**Hearing.** That one of the senses by which sound is perceived. Its external organ, the ear, is so constructed as to facilitate the impact of sound waves upon the terminations of the auditory nerve, by which in turn the stimulus is conveyed to the center for hearing in the brain. To excite sensations of sound, auditory vibrations must have a certain amplitude and duration. There are two kinds of auditory sensations, noises and musical sounds, the former caused by vibrations which are irregular in intensity or duration, the latter produced by vibrations which are periodic and regular in character. Musical tones vary in intensity, pitch, and quality or timbre. See EAR.

**Hearn,** LAFCADIO, b. 1858 in the Ionian Islands. Son of an English father and a Greek mother; long resident in America and now in Japan: author of *Chita*, 1889; *Youma*, 1890; *French West Indies*, 1890; *Out of the East*, 1895.

**Hearne,** SAMUEL, 1745–1792. Hudson's Bay official, who in 1771–72 followed the Coppermine River to the Arctic Ocean, 1,300 m. *Journey*, 1795.

**Hearne,** THOMAS, 1678–1735. English antiquarian, editor of Leland, Camden, and other documents.

**Hearsay Evidence.** That which is not based on the witness's knowledge; in English law generally inadmissible.

**Heart.** Hollow muscular organ containing four cavities, two auricles, and two ventricles, situated in the chest, the

larger portion being to the left of the middle line of the body. Blood enters the right auricle from the veins, passes into the right ventricle, which pumps it into the lungs, whence it returns into the left auricle, from which it is forced into the left ventricle, and thence into the aorta. The openings between auricles and ventricles, and into the aorta, pulmonary veins, and arteries are provided with valves which prevent regurgitation of the blood between the contractions of the organ. It is lined by a thin membrane, endocardium, which is continuous with the linings of veins and arteries, and is inclosed in a sac, pericardium, which contains a small amount of fluid and maintains it in position. The average number of pulsations per minute in the adult is ab. 80, in infants may be 140, and in disease may be beyond counting.

**Heart,** SACRED. See SACRED HEART.

**Heart Burial.** Separate burial was common in Europe in 12th and 13th centuries, and many eminent persons were thus honored down to the 17th century. The custom is now rarely practiced.

**Heart-Burn.** Dyspepsia in which there is pain at the pit of the stomach, palpitation of the heart, belching of sour gas, and a burning sensation in the throat.

**Heart-Clot.** Clot of blood which forms within the heart as the result of disease of it or of a sluggishness of the circulation, as in the last stages of some enfeebling disease.

**Heart Disease.** Any disease of the heart, including pericarditis, hypertrophy, dilatation, inflammation of the endocardium (endocarditis), and fatty degeneration. In endocarditis, the valves are usually affected and may become deformed, or small vegetations may form upon them, which are often detached and may lodge in the small vessels, constituting embolism. Rupture sometimes occurs as a result of degeneration of the tissue. Common symptoms are palpitation, difficulty in breathing, dropsy, and congestions of various organs.

**Heart Failure.** Sudden cessation of the action of the heart, which may cause instant death or simply fainting. Fatal cases are due to diphtheria, over-violent exercise, strong mental shock, or diseases of the heart.

**Hearth** (or CHIMNEY) **Tax.** Imposed by Charles II. 1662, on every hearth or fireplace in England; it produced £200,000 a year; it was abolished by William and Mary 1689, but imposed again and finally abolished.

**Hearts.** Game of cards, ranking and dealt as in Whist and played by from four to six players, sufficient lowest cards being dropped from the pack to make an even deal. There is no trump card; players must follow suit if possible, and the aim is to take no Heart cards, each calling for a chip in the pool. If only one player take no Hearts, he takes the pool; if two, they divide the pool, the odd chip going to the elder hand; if three, they either divide the pool as before, or the loser may pay 16 chips to the next pool; if all take Hearts, the lowest takes the pool, or it is added to the next.

**Heart's-Ease.** See PANSY.

**Heart Wood.** See DURAMEN.

**Heat.** Kinetic energy of molecular motion, either of translation or rotation. Until about 1800 two rival hypotheses had been entertained as to its nature: one that it was a subtle elastic fluid permeating all bodies, like water in a sponge, the other that it was due to an internal commotion among the particles of the body. In 1799 Davy conclusively overthrew the former by his famous experiment of changing ice into water by rubbing two pieces together. Rumford had already furnished good evidence to the same end. He found that the work of a single horse for two hours and twenty minutes was capable of raising to the boiling point nearly nine kilograms of water. It was not, however, till about the year 1849, when Joule made his elaborate and conclusive experiments on the relation of mechanical work to heat, that the material theory of heat was finally overthrown. Heat quantity must not be confused with heat intensity, which is called "temperature." The process of measuring the former is called "calorimetry," the latter "thermometry." Quantity of heat is measured in "calories," a calorie being the amount of heat required to raise the temperature of one gram of water one degree. Since heat is a form of energy, it must be capable of measurement in energy units or "ergs." Perhaps the most valuable series of experiments made to determine this relation was made by Rowland. His results in some cases are the means of as many as 12,000 distinct observations. They show a variation in the value of the mechanical equivalent with temperature. Thus, at 5° he obtained in absolute units $4.212 \times 10^7$ ergs for one calorie; and at 20°, $4.179 \times 10^7$ ergs. This is known as Joule's Equivalent and is represented by J.

**Heat and Work.** The quantity of heat that will raise one pound of water one degree Fahrenheit is called a heat unit. One heat unit will perform 778 foot-pounds of work; *i.e.*, lift one pound through a vertical height of 778 feet. One pound of coal can produce ab. 12,000 heat units. See CALORIC.

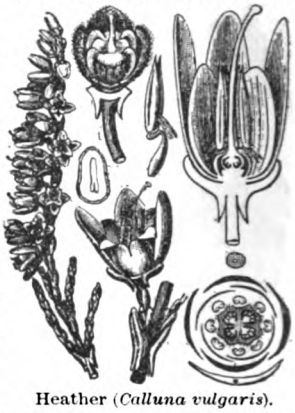
**Heat received from the Moon.** According to Lord Rosse, $\frac{1}{50000}$ of the sun's heat.

**Heated Term.** Prolonged period of hot weather; so called by E. Meriam 1853 in his reports in New York papers.

**Heater for Feed Water.** See FEED-WATER HEATER.

**Heath,** JAMES. 1757–1834. English line engraver, who executed many plates of Shakespearian subjects, after paintings by Smirke and others, and assisted in the production of the celebrated plate *Canterbury Pilgrims*, after Stothard.

**Heather.** *Calluna vulgaris.* Small-leaved shrub, of the natural family *Ericaceæ*, native of Europe; sparingly introduced into New England; known also as Ling.



Heather (*Calluna vulgaris*).

**Heathfield,** GEORGE AUGUSTUS ELIOT, LORD. 1717–1790. Scottish general, defender of Gibraltar against Spain 1779–83; Baron 1787.

**Heaths.** 1. Small, bushy shrubs of the genus *Erica*, natural family *Ericaceæ*, natives of the Old World, and especially of S. Africa, whence are derived the showy-flowered kinds extensively cultivated for ornament. 2. In e. N. America, low shrubs of the genus *Hudsonia*, natural family *Cistaceæ*.

**Heave.** Horizontal distance between the two parts of a faulted stratum or vein, measured along the strike of the fault.

**Heaves,** or BROKEN WIND. Disease of the horse, which is not well understood. The symptoms are a hollow cough and great difficulty in expiration, especially when exercising. Supposed to be due to a disease of the heart.

**Heaven.** Abode of Deity and of blessed spirits; sometimes the sky and celestial bodies.

**Heavy Metals.** Those which have a greater specific gravity than the alkalies and alkaline earths, *e.g.*, lead, silver, copper, gold, platinum.

**Heavy Spar.** Name for BARITE (q.v.).

**Hebbel,** FRIEDRICH, 1813–1863. German dramatist and poet, b. in Holstein, settled in Vienna. *Judith*, 1841; *Mary Magdalen*, 1844; *Herod and Mariamne*, 1850; *The Nibelungen*, 1862.

**Hebe.** Daughter of Zeus and Heva; goddess of youth; cup bearer in Olympus; married to Hercules after his deification.

Hebe (by Canova).

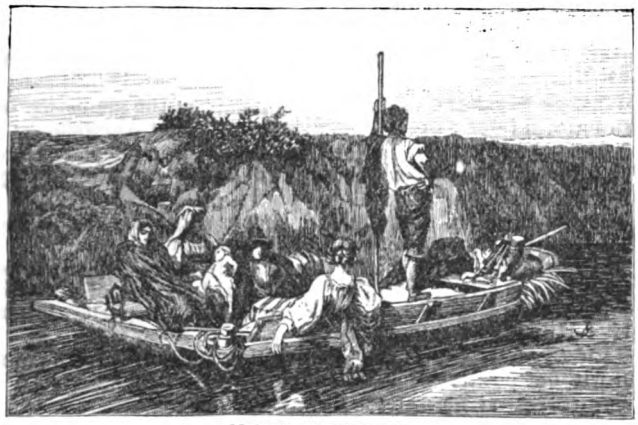
**Hebecarpous.** Plants with hairy fruits.

**Hebel,** JOHANN PETER, 1760–1826. Swiss-German poet and divine.

**Heber,** REGINALD, 1783–1826. English poet, Bp. of Calcutta 1823; author of *From Greenland's Icy Mountains* and other hymns in general use. *Palestine*, 1803; *Life of Jeremy Taylor*, 1822; *Journey*, 1828.—His half-brother, RICHARD, 1774–1833, prince of bibliophiles, collected ab. 147,000 vols. at a cost of some £100,000, and stored them in four houses in England, one in Paris, and three in Belgium. The sale, in 12 divisions extended over three years and occupied 216 days.

**Heberden,** WILLIAM, 1710–1801. English physician, author of Memoirs on Sensible Temperature; diminution of rainfall with altitude.

**Hébert,** ANTOINE AUGUST ERNEST, b. 1817. Contemporary French genre painter of sentimental tendencies. Grand Prix de Rome 1839, Legion of Honor 1853, Officer 1867, Commander



Malaria (by Hebert).

1874. Member of the Institute 1874. Director of the French School of Art in Rome from 1866.

**Hébert,** JACQUES RENÉ, 1755–1794. French terrorist, called Pére Duchesne from his newspaper, started 1789; slanderer of Marie Antoinette; guillotined.

**Hebrew.** One of the Semitic languages, with literature of the most ancient date, and spoken by the Israelites to 400 B.C., when it was replaced by the Chaldee or Aramaic, the dialect of Syria. As a literary language, it has been kept in constant use to the present day. The Samaritan stood between the Hebrew and the Aramaic, with elements of both. Characteristic of Hebrew are the lack of compound nouns and verbs, and the so-called timeless verb.

**Hebrews,** JEWS, or ISRAELITES. Descendants of Abraham through Jacob. After their sojourn of 430 years in Egypt, they escaped from bondage, ab. 600,000 fighting men, or 2,500,000 in all, to the desert of Sinai. Forty years later, 1451 B.C., they began the conquest of Canaan under Joshua. After his death succeeded a period of disorder and external oppression, that of the Judges, lasting until the founding of the kingdom under Saul 1091. David, 1051–15, extended his empire to the Mediterranean and the Euphrates. Under Solomon, 1015–975, the monarchy attained its highest splendor and power. Ten of the 12 tribes revolted 975. Israel, the northern section, established the worship of Baal. After repeated invasions and deportations, the Assyrians took Samaria 721, and Israel ceased to exist.

The southern section, Judah, was invaded from Egypt 971, from Assyria 713, and subjugated by Nebuchadnezzar 605, Jerusalem was burned, and the remnant of the Jews carried away 588. Some of the captives returned 535, others 458 and 445. The second temple was completed 515, the city walls restored 445. Judea fell into the hands of Alexander 332, of Ptolemy 320, of Antigonus 315, and of Antiochus 168. The government of the Maccabees began 166, and in 63 the Romans under Pompey became masters of Judea. Numerous insurrections occurred. Jerusalem was besieged by Titus A.D. 70, and destroyed 71; Hadrian banished the Jews 135. They are found all the world over, and in most Christian countries have been viewed with suspicion and treated with cruelty. The persecutions and outrages inflicted on them by the nations of western Europe at intervals for more than 1,000 years fill many black pages of history. England banished them 1290–1650; France 1395; Spain and Portugal 1492 and 1495. In consequence they came to reside chiefly within the bounds of the Holy Roman Empire. They gained the right to hold land in England 1723, and to sit in Parliament 1858; a Jew, Disraeli, became Premier 1868. Everywhere in modern times Jews have held high rank as financiers, authors, artists, and in other walks of life.

**Hebrews,** EPISTLE TO. Nineteenth N. T. book, of uncertain date and origin, though often ascribed to St. Paul; devoted to proving, in a style of great rhetorical brilliancy, that in Christ is found the fulfillment of all the O. T. ceremonies and types.

**Hebrides,** or WESTERN ISLANDS. Off w. coast of Scotland; some 500, ab. 100 inhabited; mentioned by Pliny and Ptolemy as Ebudæ; often celebrated in poetry and romance. The original inhabitants were Celtic; immigrants came from Norway in the 9th century. Norway ruled till 1266, then native chiefs or Lords of the Isles, till in 1510 they were annexed to Scotland. Sanguinary feuds among the clans continued till about 1720. After the abolition of the power of the chiefs many emigrated or entered the army; some 5,000 were removed to Australia 1846 in consequence of potato blight. The largest islands of the outer group are Lewis and N. and S. Uist; of that nearer the mainland, Skye and Mall. The climate, mild and moist, due to the Gulf Stream, produces good pasture. Tourists visit the islands for the beauty of the scenery. Pop. ab. 100,000.

Isle of Skye—The Kilt Rock.

**Hebron.** Very ancient town, 20 m. s. of Jerusalem; seat of the Patriarchs, and of King David for some years; long held by Edomites, then by the Maccabees, and by Crusaders ab. 1100–87; now El Khalil. Pop. ab. 9,000.

**Hebronite.** $AlPO_4.LiF$. Hydrous lithium aluminium phosphate, containing fluorine, occurring at Hebron, Maine, allied to AMBLYGONITE (q.v.).

**Hebrus.** Classic river of Thrace, now the Maritza; ab. 250 m. long. It rises in w. Roumelia, flows e. to Adrianople, and then s. to the Ægean Sea.

**Hecatæus,** OF ABDERA, 4th century B.C. Greek historian, who was with Alexander the Great upon his campaigns. Only fragments remain.

**Hecatæus,** OF MILETUS, ab. 549–ab. 479 B.C. Greek traveler and historian, cited by Herodotus. Of his *Tour of the World* and *Genealogies* the fragments were collected 1831.

**Hecate.** Mysterious divinity, the only one of the Titans who retained power under the rule of Zeus; called three-formed

Hecate.

and three-headed; identified with Selene (Luna) in heaven, Artemis (Diana) on earth, and Proserpine in the lower world. She taught sorcery, sent demons and frightful phantoms by night from the infernal regions, and wandered about with the

souls of the dead; her approach was betokened by the whining and howling of dogs.

**Hecatomb.** Sacrifice of many (orig. 100) bulls or other animals, in the ancient Greek rites.

**Hecatompylos.** City in Parthia, royal residence of the Arsacidæ. Thebes in Egypt is sometimes called Hundred-gated.

**Heck,** BARBARA, 1734–1804. Irish immigrant to New York ab. 1760, through whose zeal the first Methodist Society in America was formed, 1765–66.

**Hecker,** FRIEDRICH KARL FRANZ, 1811–1881. Revolutionist of Baden, farmer in Ill. from 1850.

**Hecker,** ISAAC THOMAS, 1819–1888. American R. C. divine, founder of the Paulist order 1858, and of the *Catholic World*, 1865. *Questions of the Soul*, 1855; *Catholicity in the U. S.*, 1879.

**Hecker,** JUSTIN FRIEDRICH KARL, 1795–1850. Prof. Berlin; medical writer. *Epidemics of Middle Ages*, tr. 1846.

**Heckewelder,** JOHN GOTTLIEB ERNEST, 1743–1823. American Moravian missionary. *Indian Nations*, 1818; *Narrative of the Missions*, 1822.

**Hecla.** Volcano of Iceland, one of the most active on the globe; 68 m. e. of Reykjavik. Altitude 5,110 ft. Its last eruption, the 18th since 1100, was in 1845–46.

**Hectare.** Equal to 100 ARES (q.v.), or 2.47 acres.

**Hectic Fever.** Fever occurring in tuberculosis or diseases accompanied by formation of pus, in which the temperature rises irregularly, usually during the afternoon, and cold sweats and chills occur. It is not a specific fever, but a symptom of the disease it accompanies.

**Hectocotylus.** One of the arms of the male cuttle-fish, charged with spermatophores and detached; apparently parasitic in the mantle cavity of the female. When not detached from the male, it is said to be hectocotylized, and is prepared to act as a sort of intromittent organ. Usually the left ventral arm is thus modified.

**Hector.** Son of Priam and husband of Andromache; chief hero of Troy. He slew Patroclus, was slain by Achilles, and his body dragged into the Greek camp, but restored to Priam by command of Zeus.

**Hector,** MRS. ANNIE FRENCH ("MRS. ALEXANDER"), b. ab. 1825 in Ireland. Novelist. *The Wooing o't*, 1873; *Ralph Wilton's Weird*, 1875; *Her Dearest Foe*, 1876; *At Bay*, 1885.

**Hector,** SIR JAMES, b. 1830. Director of the geological survey and founder of the meteorological service for New Zealand.

**Hecuba.** Wife of Priam, mother of Hector, Paris, and Cassandra. After the fall of Troy she was enslaved by the Greeks, was changed into a dog, and leaped into the sea.

**Hedberg,** FRANZ TEODOR, b. 1828. Swedish dramatist. *King Märta*, 1860; *Wedding at Ulfasa*, 1865. He has pub. 2 vols. on Swedish actors and singers.

**Hedenbergite.** $CaFeSi_2O_6$. Calcium, iron pyroxene, with little or no aluminium, dark green in color.

**Hederaceous.** Resembling or related to ivy.

**Hedge.** Fence made of living plants growing in line close enough to prevent the passage of animals. A perfect hedge plant must be of vigorous growth, perfectly hardy in the locality where grown, and must possess the power of continually throwing out new shoots close to the ground, when cut back. Osage orange, honey locust, and several varieties of thorn are the leading plants for useful hedges in the n. U.S. For ornamental hedges a large variety of shrubs and trees may be used.

Hedge-Bells.

**Hedge,** FREDERICK HENRY, D.D., 1805–1890. Unitarian pastor at Brookline, Mass., 1856; prof. Harvard 1872–81; poet and essayist. *Prose Writers of Germany*, 1848; *Reason in Religion*, 1865; *Hebrew Tradition*, 1870; *Atheism*, 1884; *German Classics*, 1886; *Luther*, 1888.

**Hedge-Bells,** or HEDGE-BINDWEED. *Convolvulus sepium.* Native throughout Europe along hedgerows and in sandy places; also common in America, China, Persia, and some parts of India. It is a showy, handsome flower with red or white corolla.

**Hedgehogs.** Old World mammals. The common hedgehog of Europe is the size of a large rat and the largest of 19 known species; it is distributed from Ireland to China. It is noted for its perfect hibernation. Its voice resembles that of the pig. See ERINACEIDÆ.

**Hedgehog Thistle.** Species of the genus *Echinocactus*, natural family *Cactaceæ;* natives of Mexico and the southwest U. S.

**Hedge Hyssop.** Small marsh plants of the genus *Gratiola*, natural family *Scrophulariaceæ*; natives of America.

**Hedgeley Moor.** In Northumberland, near Wooler. Here the Lancastrians under Montagu defeated and slew Percy April 25, 1464.

**Hedge Nettle.** Plants of the genus *Stachys*, herbs of the Mint family, of wide geographical distribution.

**Hedonism.** Theory of ethics which makes pleasure or happiness the criterion and end of all right conduct, though it qualifies this pleasure by its degrees or kinds of purity, intensity, fertility, and extent.

**Hedonistic Zero.** Neutral feeling when free from pain, but without positive sensation of pleasure.

**Hedriophthalmata.** See ARTHROSTRACA.

**Hedwig,** JOHANN, 1730–1799. Prof. of Botany in Leipzig; bryologist. *Fundamentum historiæ naturalis muscorum frondosorum*, 1782; *Theoria generationis et fructificationis plantarum cryptogamicarum*, 1784; *Descriptio et adumbratio microscopico-analytica muscorum frondosorum*, 1787–97; *Species muscorum frondosorum*, 1801.

**Heel** OF A FROG. Part near the widest portion of the triangular tongue of a railroad frog.

**Heel** OF A SWITCH. Ends of switch-rails which are fixed. Those which are movable are called the toe.

**Heem,** JAN DAVID VAN, ab. 1604–1683. Dutch painter, especially of flowers.

**Heemskerk,** MARTEN VAN, 1498–1574. Dutch historical painter; he imitated Michelangelo: chief works, *Nativity, Holy*

Destruction of the Altars and Priests of Baal (by Heemskerk).

*Family, Brazen Serpent, Ecce Homo, Belshazzar's Feast, Triumph of Silenus*, and *Destruction of Baal.*

**Heer,** OSWALD, 1809–1893. Prof. Zurich 1834–52; pioneer of Paleobotany. *Flora fossilis artica*, 1868–71; *Flora fossilis Alaskana*, 1869.

**Heeren,** ARNOLD HERMANN LUDWIG, 1760–1842. Prof. Göttingen from 1794. *Ideen uber Politik*, 1793–96: *History of Ancient States*, 1799, tr. 1833; *Hist. European State Systems*, 1809.

**Heermann,** JOHANN, 1585–1647. German hymnist.

**Hefele,** KARL JOSEPH VON, D.D., Ph.D., 1809–1893. R. C. prof. at Tübingen 1837, Bp. of Rottenburg 1869. *History of Councils*, 7 vols., 1855–74, tr. in part 1871–82.

**Hegel,** GEORG WILHELM FRIEDRICH, 1770–1831. German philosopher, prof. Berlin from 1818: founder of Absolute Idealism, based on the identity of thought and and being. His chief practical interest lay in counteracting the negative tendencies of Kantianism, and therefore in the direction of politics and religion; but his style made his system incomprehen-

sible to ordinary minds, and originated the statement attributed to himself, "One man has understood me, and even he has not." His chief ability, however, lay in the analysis of the historical movement of human thought. *Phenomenologie des Geistes*, 1807; *Logik*, 1812-16; *Philosophie der Geschichte*, tr. 1857. *Works*, 18 vols., 1832-45.

**Hegelund,** PEDER JENSEN, 1542-1614. Danish poet, dramatist, and translator.

**Hegesias,** 3d century B.C. Greek orator of Magnesia, w. Asia Minor.

**Hegesippus,** 2d century. Earliest Ch. historian; probably a Jewish convert; imperfectly known to us through Eusebius.

**Hegirah,** or HEDJRAH. Flight of Mohammed from Mecca to Medina 622; regarded as the beginning of the Mohammedan religion and chronology.

**Heiberg,** PETER ANDREAS, 1758-1841. Danish satirist, poet, and dramatist, exiled 1799, and thenceforth resident in Paris.—His son, JOHAN LUDVIG, Ph.D., 1791-1860, prof. at Kiel 1822-25, was poet to the Copenhagen theater from 1829, and produced plays, poems and critical essays. *King Solomon*, 1825; *April Fools*, 1826; *On the Vaudeville*, 1827.

**Heidelberg.** City of Baden, Germany, on the Neckar; capital of the Palatinate ab. 1250-1720; famous for beauty of

Castle Court of Heidelberg in 1683.

situation and for the ruins of its castle; partly destroyed by the French 1689, and by fire 1764. In its vaults is a tun with a capacity of 50,000 gallons. Pop., 1890, 31,737.

**Heidelberg,** UNIVERSITY OF. Oldest in Germany; founded 1386; controlled by Protestants from 1556; greatly injured by the Thirty Years' War; reorganized 1803. The library was sent to Rome in 1623, afterward to Paris, and restored to Heidelberg 1815; it has ab. 500,000 vols. The students in 1895 numbered 1,230.

**Heidelberg Catechism.** Framed 1563 by Ursinus and Olevianus; accepted by German Calvinists, and still the standard of the Reformed bodies there and in America.

**Heidelberg University.** At Tiffin, O.; incorporated 1851; directed by the Reformed Ch. It is open to women, and has (1895) 14 professors and 97 students. A theological seminary, founded 1850, has 29 students. Total of students in all departments, including preparatory, 288.

**Heidenhain,** RUDOLF PETER HEINRICH, b. 1834. Prof. Breslau from 1859; writer on physiology.

**Heights,** MEASUREMENT OF. See LEVELING.

**Heijn,** or **Heyn**, PIET, 1570-1629. Dutch admiral, noted for victories over the Spaniards.

**Heilbronn.** Old town of Würtemberg, on the Neckar. Here an alliance was concluded between Swedes and German Protestants April 16, 1633. Pop., 1890, 29,939.

**Heilprin,** MICHAEL, 1823-1888. Hungarian revolutionist, in the U. S. from 1856; son of PHINEAS MENDEL (1801-1863), Polish Jew and Hebrew author. *Historical Poetry of the Hebrews*, 1879-80.—His son, ANGELO, b. 1853 in Hungary, Prof. Academy of Natural Sciences, Phila., 1880, and Wagner Free Institute 1885, is a writer on geology and paleontology.

**Heim,** FRANÇOIS JOSEPH, 1787-1865. French historical painter.

**Heimdal.** Son of Odin; watchman of the Norse gods.

**Heimskringla.** See SNORRI STURLASON.

**Heine,** HEINRICH, 1799-1856. German poet and satirist. Born a Jew, he accepted baptism ab. 1825 from civil and prudential reasons. His first poems, 1822, and plays, 1825, won little attention, but he sprung into fame with the first part of his prose *Reisebilder* (Pictures of Travel), 1826-31, and *Book of*

Heinrich Heine.

*Songs*, 1827. From 1831 he lived in Paris, pensioned 1836-48; from 1847 spine disease confined him to his "mattress-tomb." Among his later works are *The Salon*, 1834-40, *Atta Troll*, 1847, and *Romanzero*, 1854. He was a licensed jester, whose unequaled wit was turned against all things in earth and heaven; but his songs are often notable for delicacy, depth, and pathos.

**Heineccius,** JOHANN GOTTLIEB, 1681-1741. Prof. Halle 1713-23 and from 1733; Latin writer on jurisprudence. *Law of Nature and of Nations*, 1737, tr. 1763; *Opera*, 9 vols., 1771.—His brother, MICHAEL, 1674-1722, pub. *De Veteribus Sigillis*, 1709.

**Heinsius,** ANTONIUS, 1641-1720. Grand pensionary of Holland 1688. He exerted much influence in the affairs of Europe.

**Heinsius,** DANIEL, 1580-1655. Prof. Leyden 1605; ed. Greek and Latin poets.—His son, NICOLAUS, 1620-1681, diplomatist, edited several classics. Both were good Latin writers.

**Heintzelman,** SAMUEL PETER, U.S.A., 1805-1880. Major-gen. of Vols. 1862-65; engaged in the Va. battles of 1861-62.

**Heir.** In English Law, one who receives the real estate of an intestate; in common usage, any one who inherits property by bequest or otherwise.

**Heir Apparent.** Direct heir, whose right cannot be set aside while he lives; in England, the eldest son.

**Heirlooms.** Chattels which the English law gives to heir with the real estate, such as deeds, the keys of a house, and fish in a pond.

**Heir Presumptive.** Next in succession, as a daughter or nephew, whose right may be set aside by the birth of a direct heir. In U. S. the children inherit equally.

**Hejira.** See HEGIRA.

**Hel,** or HELA. In Norse mythology, goddess of death or the lower world; daughter of Loki. She lived on the brains and marrow of men.

**Helbig,** WOLFGANG, b. 1839. German archæologist.

**Held,** ADOLF, 1844-1880. Prof. Bonn 1872; long Sec. of the *Verein für Sozialpolitik*. *Die Einkommenstener*, 1872; *Grundriss zu Vorlesungen über Nahinalökonomie*, 1878; *Zwei Bücher zur Sozialen Geschichte Englands*, 1881.

**Helder.** Town of n. Holland, fortified by Napoleon 1811; protected by a dike, and connected with Amsterdam by a canal; important naval station. De Ruyter defeated an English fleet near here Aug. 21, 1673.

**Helderberg,** LOWER. Uppermost Silurian stratum in N. America, and equivalent to the Ludlow Limestones in England; named from the Helderberg Mountains in N. Y.

**Helderberg,** UPPER. Limestone near the base of the Devonian system in e. N. America; now usually called the Corniferous.

**Helen.** Daughter of Zeus and Leda, sister of Castor and

Pollux; carried to Attica by Theseus, but rescued by her brothers. Sought in marriage by nobles from all Greece, she chose Menelaus; was seduced by Paris, taken to Troy, and so became the cause of the Ten Years' War, after which she was reunited to Menelaus and lived with him in happiness at Sparta.

**Helena.** Capital of Phillips co., Ark.; scene of a Union victory, July 4, 1863. Pop., 1890, 5,189.

**Helena.** Capital of Montana and of Lewis and Clark co., on Little Prickly Pear Creek, at the base of the Rocky Mts. Pop., 1890, 13,834.

**Helena,** St., ab. 248–ab. 328. Mother of Constantine, divorced by Constantius I. 292; said to have discovered Our Lord's tomb, the wood of the cross, the seamless garment, etc. Her day is Aug. 18.

Vision of St. Helena, by Paul Veronese (National Gallery).

**Helenus.** Son of Priam; subject of varying legends of the Trojan war.

**Helenus,** 3d century B.C. Son of Pyrrhus; engaged with him in s. Italy and at Argos.

**Heliacle.** Rising of a star in morning twilight immediately in advance of the sun, or its setting immediately after the sun. The heliacle rising of Sirius was looked for each year with great interest by the Egyptian priests, as it foreshadowed the rising of the Nile.

**Héliade,** Jean (Radulesen), 1802 – 1872. Roumanian author.

**Heliand.** Old Saxon harmony of the Gospels in verse of 9th century.

**Helianthin.** $C_{14}H_{14}N_3SO_3K$. Methyl orange, or Orange III. Sodium salt of the acid, produced by the action of the diazo compound of sulphonilic acid upon dimethylaniline; ochre-colored substance, used as an indicator in analytical chemistry. Its water solution is yellow when alkaline and deep red when acid.

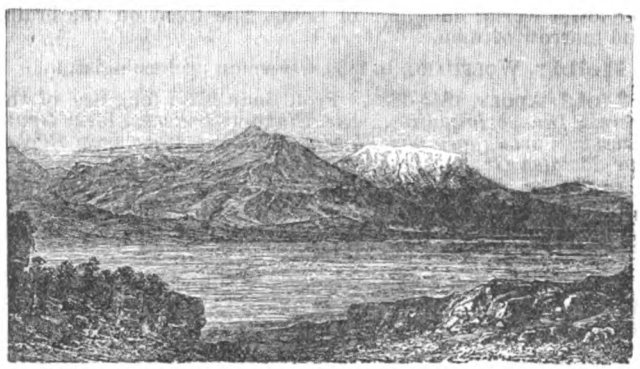
**Helical Gear.** See Gear Wheels.

**Helicoid.** Coiled structures resembling a snail-shell, especially coiled flower-clusters.

**Helicoid.** Warped surface generated by a straight line, every point of which has a uniform motion parallel to a fixed straight line, and also a uniform motion about it. Each point of the generating line describes a curve, called the Helix.

**Helicoidal Anemometer.** Modification of Woltmann's anemometer. The radial arms are dispensed with, and plates bent into helicoidal surfaces, similar to those of the screw propeller, are used to receive the impulse of the wind. See Anemometer.

**Helicon.** Range of mountains in s.w. Bœotia, sacred to Apollo and the Muses. Here sprung the fountains, Hippocrene



Plain of Platæa with the Helicon; Parnassus in the background.

and Aganippe, whose waters were supposed to give poetic inspiration.

**Heligoland,** or Helgoland. Islet in the North Sea; taken from Denmark by Great Britain 1807; ceded to Germany 1890. The Danish fleet won a victory near it May 9, 1864. Pop. 2,086.

**Heliocentric Place of a Star.** Position as seen from the center of the sun.

**Heliochromoscope.** See Ives' Photochromoscope.

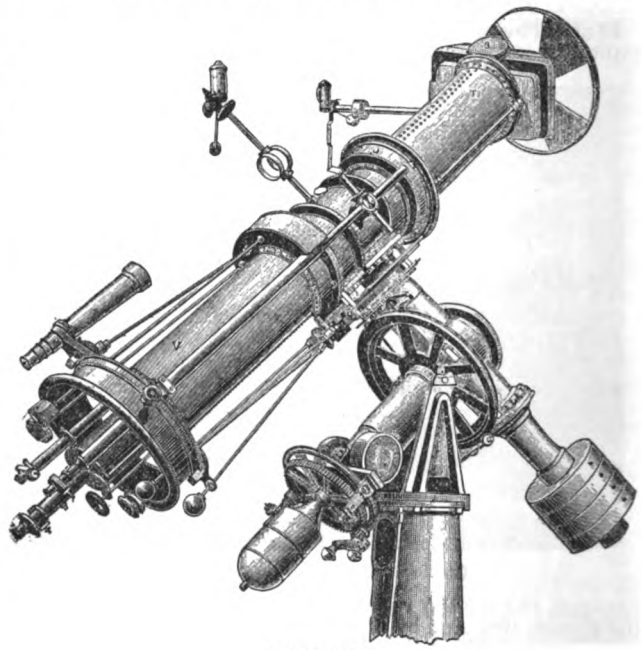
**Heliodorus.** Greek of Emesa, Syria, whose romance, *Æthiopica*, was long highly esteemed.

**Heliogabalus.** See Elagabalus.

**Heliograph.** Instrument invented by Mance, consisting of a heliostat furnished with a small lever-key, by which the mirror can be deflected to the right or left through a small angle, so that corresponding flashes of light may be observed at a distant station and interpreted by the observer according to a prearranged code of signals. See Heliotrope.

**Heliogravure.** See Photogravure.

**Heliometer.** Instrument for measuring distances between neighboring stars. It consists of a telescope with the object glass sawed in two along a diameter so arranged that the two



Heliometer.

halves can slide by each other. The amount of displacement is shown by a scale. The distance between two stars viewed through the two halves of the object glass respectively is given very accurately by this scale.

**Heliopolis.** Greek name of an Egyptian site near the head of the Delta. As the ancient On it was a chief seat of sun worship and center of learning. The obelisk, dating from Usertasen, 12th Dynasty, is its only remaining antiquity to be seen there now. Four others, once there, are now in Rome, London, Constantinople, and New York.

**Heliopolis.** See Baalbek.

**Helioporidæ.** Family of Alcyonarians, whose corallites are parallel tubes of two sizes, united by cœnenchyma, and having tabulæ. The larger tubes have imperfect septa. Here most of the old group of *Tabulata* belong.

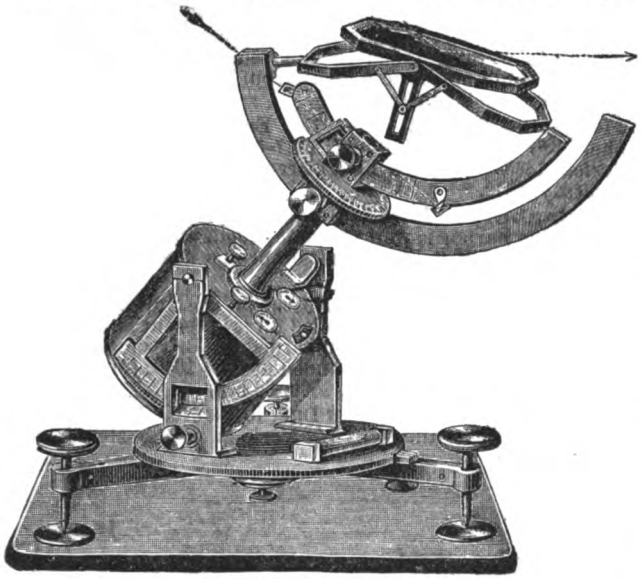
**Helios,** or Helius. In Greek Mythology, the sun, or his charioteer; son of Hyperion and Theia, brother of Selene and Eos; extensively worshiped; partly identified with Phœbus.

**Helios.** That form of the nucleus during cell division in which the chromatin loops radiate from a center in all directions of space equally; sun stage of karyokinesis.

**Helioscope,** or Solar Eyepiece. Telescopic eyepiece arranged for viewing the sun. A common form is provided with a plane glass reflector, through which the greater part of the sun's light and heat passes, only a small part being reflected to the eye.

**Heliosphærida.** Group of *Ectolithia*, including those *Radiolaria* in which the central capsule is surrounded by concentric lamellæ of a network of spicules. There are also radiating spicules.

**Heliostat.** Instrument consisting of a mirror moved by clockwork in such a way as to throw the sun's rays always in

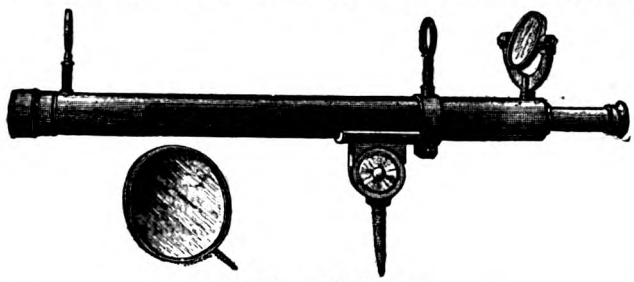


Silbermann's Heliostat.

the same direction, notwithstanding the earth's diurnal motion. It is commonly employed in connection with a photographic telescope or a spectroscope.

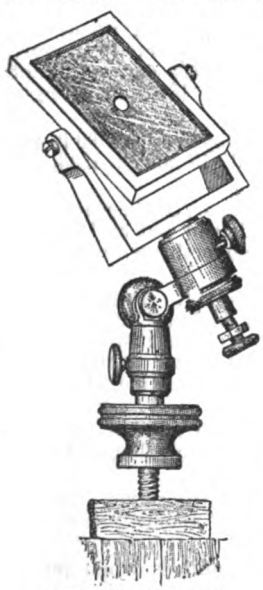
**Heliotrope.** See BLOODSTONE.

**Heliotrope.** Instrument invented by Gauss, having a mirror and sights by which the rays of the sun are reflected to



Coast Survey Heliotrope.

a distant station; used mainly for signals in geodetic surveying. Such signals have been seen at distances of nearly 200 miles. It is known to the British military world as the Heliograph, which is a misnomer. The heliotrope requires clear weather and oftentimes the light is unsteady, due to disturbances in the atmosphere. Messages are sent with it by interposing an object before the mirror at irregular intervals. The best time to use it is the hour preceding sunset.



Steinheil Heliotrope.

**Heliotrope.** Plants of the genus *Heliotropium*, natural family *Boraginaceæ*, natives of warm countries. The fragrant garden heliotrope is *H. peruvianum*, native of Peru.

**Heliotrope,** INDIAN. *Heliophytum indicum*. Coarse herb of the Borage family, native of India; introduced as a weed into the s. U. S.

**Heliotropism.** Phenomena of movement shown by growing vegetable organs which are not equally illuminated on all sides.

**Heliotype.** See AUTOTYPE.

**Heliotype.** See PHOTOGELATINE.

**Heliozoa.** Fresh-water Rhizopods, of spherical shape, from which radiate slender, nearly motionless, pseudopodia. They are often multinucleate, have contractile vacuoles, and sometimes a siliceous skeleton of latticed shells or of radiating spines. *Actinosphærium* is an example of a multinucleate, naked form; *Actinophrys*, the Sun Animalcule, has a single nucleus. See also APHROTHORACA, CHLAMYDOPHORA, CHALAROTHORACA, and DESMOTHORACA.

**Helius.** See HELIOS.

**Helix.** Curve traced by a point moving uniformly along an element of a right cylinder, as this element moves uniformly about the axis of the cylinder.

**Helix.** Scroll or volute of a Corinthian capital. Same as cauliculus.

**Helix.** See STYLOMMATOPHORA.

**Hell.** Place or state of future punishment; word loosely used in King James's version as equivalent of Sheol in O. T., Hades and Gehenna in N. T.

**Hell,** MAXIMILIAN, 1720–1792. Astronomer at Vienna. His observations, preserved in MS., caused much controversy.

**Hellanicus,** ab. 496–ab.411 B.C. Greek traveler and descriptive writer. Fragments of his works remain.

**Hellas.** Originally a city and region of Thessaly; then Thessaly; at last the whole of Greece, or of the lands inhabited by the Hellenes.

**Hellbender.** *Menopoma alleghaniensis.* Fresh-water salamander found in the Ohio R. It has four small legs. See MENOPOMA.

**Hellebore.** Vernal flowering plants of the genus *Helleborus*, natural family *Ranunculaceæ*, natives of Europe. *H.*

Hellebore (*Helleborus niger*).

*viridis*, the Green Hellebore, has been sparingly introduced as a weed into N. America.

**Hellebore,** FALSE. Plants of the genus *Veratrum*, natural family *Liliaceæ*, natives of the n. hemisphere. *V. viride*, the American White Hellebore, is known also as Indian Poke, and contains a poisonous alkaloid VERATRIA (q.v.).

**Hell-Diver.** Name given in the U. S. to various species of GREBES (q.v.).

**Hellen.** In Greek mythology, son of Deucalion and Pyrrha, father of Dorus, Æolus, and Xuthus, and through them ancestor of the Greek tribes.

**Hellenes.** Descendants of Hellen; all Greeks of unmixed stock; also, citizens or subjects of modern Greece.

**Hellenistic Greek.** Language of the Septuagint, the N. T., Josephus, Philo, and some early Christian writers; marked by frequent Hebrew idioms.

**Hellenists.** Jews who spoke Greek and adopted Greek ideas and customs; numerous after Alexander's times, often powerful in the Maccabean era, and prominent at Alexandria.

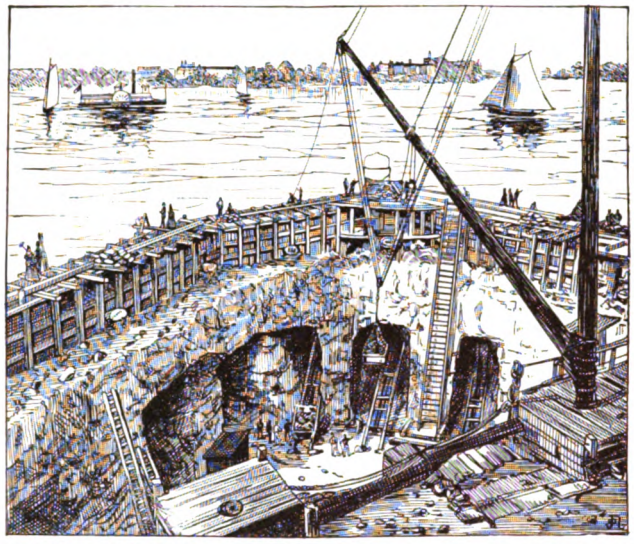
**Heller,** STEPHEN, 1813–1888. Hungarian pianoforte virtuoso and composer, in Paris from 1838. *Im Walde, Nuits blanches, Promenades d'un solitaire*, tarantelles, studies, sonatas, caprices and nocturnes.

**Hellespont.** Strait between the Propontis and the Ægean; said to be named from Helle, who was fabled to have fallen into the sea from the back of the ram with the golden fleece. See DARDANELLES.

**Hellespont Wind.** Steady easterly wind prevailing during ten months of the year in the Dardanelles.

**Hellfire Clubs.** Established by wild youth in Jacobean times for riot, drunkenness, beating the watch, etc. Three in the Strand, Conduit St., and Westminster were suppressed 1721.

**Hell Gate.** Entrance to the East River, New York, from Long Island Sound. The ridge of rock which the swift tide



Coffer Dam, Main Shaft, and Entrance to Headings, Hell Gate, East River.

rendered so dangerous to navigation was finally removed by extensive blasting operations under Gen. Newton 1885. The explosives used weighed ab. 22½ tons. See BLASTING.

**Hellman,** JOHANN GEORG GUSTAV, Ph.D., b. 1854. Assistant in the Royal Meteorological Institute of Berlin; co-editor *Meteorologische Zeitschrift. Repertorium Deutschen Meteorologie*, 1884.

**Hellquist,** CARL GUSTAF, b. 1851. Swedish historical painter, now prof. at Berlin.

**Helm.** Apparatus by which a ship is steered; usually the lever, moving the rudder.

**Helmet.** Defensive head-covering, made originally of leather, afterward strengthened and ornamented with linked mail or the addition of bronze and other metals, and finally

Helmets.

made entirely of metal lined with felt or wadding. It varied in form from a simple skull-cap to an elaborate work of art with lofty crest or plumes.

**Helmholtz,** HERMANN LUDWIG FERDINAND VON, 1821–1894. Prof. of Physiology at Königsberg 1850, Bonn 1855, and Heidelberg 1858; Prof. of Physics at Berlin 1871; Director of the Physical Institute at Charlottenberg 1887; ennobled 1883; investigator of the highest importance in several fields; author of mathematical memoirs on the motion of the earth's atmosphere. *Conservation of Force*, 1847–54; *Sensations of Tone*, 1862; *Physiological Optics*, 1866; *Popular Lectures*, 1865–76.—His son, ROBERT, 1860–1888, was author of two memoirs on the radiation of light and heat from gases, which are the foundation of our knowledge of this subject as applied to the atmosphere.

**Helminthocladiaceæ.** Order of *Algæ* of the sub-class *Rhodophyceæ*, inhabiting both fresh water and the sea.

**Helminthology.** Natural history of worms.

**Helmium.** One of the doubtful elements.

**Helmont,** JAN BAPTISTA VAN, 1577–1644. Flemish chemist and mystic, who worked in the borderland between alchemy and science. *Ortus Medicinæ*, 1648.

**Helmstedt.** Town of Brunswick, noted for its Protestant university, founded 1574, suppressed 1809 by Jerome Bonaparte as King of Westphalia. Pop., 1890, 10,955.

**Heloderma.** See GILA MONSTER.

**Heloise.** Mistress of ABELARD (q.v.).

**Helots.** Serfs or bondsmen in ancient Sparta; the original population, conquered by the Dorian invaders. They belonged to the state, were assigned to the wealthier citizens for farm labor, and could not be sold away from the land. They served in war under their masters.

**Helps,** SIR ARTHUR, 1813–1875. English essayist and biographer. *Friends in Council*, 1847–59; *Spanish Conquest in America*, 1855–57; Lives of Pizarro, 1869, Cortez, 1871, and T. Brassey, 1872.

**Helsingborg.** Town in Sweden, opposite Elsinore, on the Sound. The harbor is well protected from storms and is a port of refuge. The Kamlosa mineral springs are near by. Pop. 20,400.

**Helsingfors.** Seaport of Russia, on the Gulf of Finland at the mouth of the Wanna; founded on its present site 1639; capital of Finland since 1819; bombarded by British and French Aug. 1855. Its university, founded at Abo 1640, removed 1828, has ab. 1,000 students. Pop., 1890, 65,535.

**Helst,** BARTHOLOMÆUS VAN DER, 1613–1670. Dutch portrait painter. A fine example of his work is in the Metropolitan

Awarding the Archery Prize, by Helst (Louvre).

Museum of New York. His *Muster of the Burgher Guard*, with thirty full-length figures, Reynolds pronounced the first picture of portraits in the world.

**Helvellyn.** Mountain in Cumberland, on the mountain chain between Keswick and Ambleside. Height, 3,118 feet.

**Helvetia Green.** Sodium of salt of the sulpho acid, produced by the action of sulphuric acid on the benzaldehyde green base.

**Helvetic Confessions.** Two were drawn up at Basel 1534–36, but not adopted; the second was suspected as favoring Lutheran doctrine. That of Bullinger, 1562–64, was adopted 1566 in Switzerland and Scotland, and later in Hungary, France, Poland, and Bohemia.

**Helvetic Republic.** Established by France 1798 in place of the Swiss Confederation. It lasted till March, 1803, when the cantonal system was restored.

**Helvetii.** Celts anciently occupying w. Switzerland. They invaded Italy with the Cimbri; were driven out by Marius 101 B.C.; descended upon Gaul, and were overthrown with heavy loss by Cæsar 58 B.C.

**Helvetius,** CLAUDE ADRIEN, 1715–1771. French philosopher, author of two treatises, *De l'Esprit*, 1758, and *De l'Homme*, 1772. The former, for its materialism, was condemned and burned in Paris. He contributed to the *Encyclopédie*, and anticipated Bentham in the doctrine of utilitarianism.

**Helvite.** Beryllium, manganese, iron silicate with from five to six per cent of sulphur, yellowish in color, and resembling some varieties of garnet.

**Hemans,** MRS. FELICIA DOROTHEA (BROWNE), 1793–1835. English poet, long popular. *Records of Women*, 1828; *Songs of the Affections*, 1830.

**Hematite.** $Fe_2O_3$. Iron ore, containing, when pure, 70 per cent iron and 30 per cent oxygen. The most objectionable impurities are sulphur and phosphorus. It occurs in many varieties, differing in external appearance, but usually in red or dark grayish-black masses whose powder has a characteristic red or brownish red color, which distinguishes it from other ores of iron of similar appearance. A crystallized variety, whose facets have a splendent metallic luster, is known as

specular ore. Red ocher is an earthy variety; and red chalk, reddle, or keel, is hematite with some admixture of clay. Hematite occurs chiefly in the form of beds, sometimes of very great extent; associated with the older geological formations. In some hematite mines the ore is soft and earthy, in others hard and compact. Much of the hematite in the Menominee district of Michigan is strikingly bluish in color.

**Hematite,** BROWN. See BOG IRON ORE.

**Hemelytra.** Anterior pair of wings of *Rhynchota*, hardened throughout only a part of their extent to form wing-covers.

**Hemibranchii.** See ACANTHOPTERI.

**Hemicarp.** See MERICARP.

**Hemichordata.** See CHORDATA.

**Hemicyclic.** Flowers some of whose cycles are arranged in verticils and others in spirals.

**Hemi-Cyclone.** Upper or lower half of a cyclonic system, the dividing plane being supposed to be horizontal.

**Hemidactyl.** Having an oval disk at the base of the toes, as in certain Lizards.

**Hemimetabola.** Insects with incomplete metamorphosis; the larva is active through life and differs from the adult chiefly in having no wings. The orders included are *Rhynchota* (*Hemiptera*, *Homoptera*, *Heteroptera*, *Thysanoptera*), *Orthoptera*, and *Neuroptera*.

**Hemiplegia.** Paralysis of one lateral half of the body, due to disease or injury of either the brain or spinal cord. In the former case, the entire half of the body is usually affected, while in the latter the lower lateral half may be solely involved.

**Hemiptera** (HETEROPTERA; BUGS). Sub-order of *Rhynchota*. The bugs have the front wings as hemelytra, lying horizontally on the body. In many species the females are wingless, and often the males too. The prothorax is large and movable; the rostrum arises from the frontal region of the head, and when at rest is folded beneath the thorax. There are two tribes, the Waterbugs (*Hydrocores*) and Landbugs (*Geocores*). The term is thus used in a restricted sense; in a broader sense it is equivalent to *Rhynchota*. In vulgar usage the beetles are wrongly called bugs, as the Potato-bug and June-bug.

**Hemitropous.** See AMPHITROPOUS.

**Hemlock.** *Conium maculatum.* Poisonous, white-flowered plant of the Carrot family, native of Europe, introduced as a weed into N. America. All parts of the plant contain the alkaloid conia, most in the seeds; it is a volatile liquid, tastes like tobacco, and produces death with tetanic convulsions. See CONIUM.

**Hemlock.** GROUND. See YEW.

**Hemlock,** WATER. See BEAVER POISON.

**Hemlock Parsley.** *Conioselinum chinense.* Marsh plant of the Carrot family, native of n. N. America.

**Hemlock Spruce.** *Tsuga canadensis.* Large forest tree of the natural family *Coniferæ*, native of N. America.

**Hemmingsen,** NIELS, 1513–1600. Prof. at Copenhagen 1543–79, deprived for Calvinism. *Way of Life*, 1570; *Syntagma*, 1574; *Opuscula Theol.*, 1586.

**Hemoglobin.** See HÆMOGLOBIN.

**Hemorrhage.** See HÆMORRHAGE.

**Hemorrhoids.** See HÆMORRHOIDS.

**Hemp.** *Cannabis sativa.* Coarse plant of the Nettle family, native of Europe and Asia, introduced into N. America; very valuable for its tough, fibrous inner bark; chiefly grown in Kentucky. It is sown broadcast in the spring on land prepared as for corn, and matures in ab. 100 days. It is then cut and allowed to cure for ab. two weeks, after which it is stacked until ab. Dec. 1, when it is spread out on the ground and retted. It is then gathered into shocks, where it stands until "broken," when it is ready for market. Hemp fiber is used for twine and rope making, and is also woven into fabrics for domestic use and for sail cloth.

Hemp (*Cannabis sativa*).

**Hemp,** INDIAN. See DOGBANE.

**Hemp,** MANILLA. *Musa textilis.* Large plant of the Banana family, native of the Philippine Islands; cultivated extensively for its fiber, which is known also as Abaca, and is used for rope making.

**Hemp,** SISAL. *Agave sisalana.* Large herb of the Lily family, cultivated in warm countries as a fiber plant.

**Hemp,** WATER. *Acnida cannabina.* Tall herb of the natural family *Amarantaceæ*, native in salt marshes along the Atlantic coast of the U. S.

**Hempel,** CHARLES JULIUS, M.D., 1811–1879. German-American writer on homeopathy, 1865–74.

**Hemp Nettle.** Herbs of the genus *Galeopsis*, of the Mint family, natives of Europe, introduced as weeds into N. America.

**Hempweed,** CLIMBING. *Willoughbya scandens.* Vine of the Composite family, native of e. N. and S. America.

**Hemsterhuis,** TIBERIUS, 1685–1766. Prof. at Amsterdam, Franeker, and Leyden; editor of Lucian and other Greek classics.

**Hénault,** CHARLES JEAN FRANÇOIS, 1685–1770. French historian, Academician 1723.

**Henbane.** *Hyoscyamus.* Genus of *Solanaceæ;* coarse, lurid flowered weeds, natives of Europe. The Black Henbane,

Henbane (*Hyoscyamus niger*).

*H. nigra*, has been introduced into N. America; the leaves and seeds contain the poisonous alkaloid HYOSCYAMIN (q.v.).

**Henderson,** ALEXANDER, 1583–1646. Scottish divine, leader in resisting Charles I.'s attempt to impose Episcopacy on the realm 1636 and later. He drew up the petition and bond 1637–38, and the Solemn League and Covenant 1643.

**Henderson,** EBENEZER, D.D., 1784–1858. Scottish missionary and linguist, prof. Highbury Coll., Eng., 1830–52. *Travels in Russia*, 1826; *Inspiration*, 1836; tr. O. T. prophets, 1840–55.

**Henderson,** JAMES PINCKNEY, 1808–1858. First Gov. of Texas 1846–47; Gen. in the war with Mexico; U. S. Senator 1857.

**Henderson,** JOHN BROOKS, b. 1826. U. S. Senator from Mo. 1862–69.

**Henderson,** PETER, 1823–1890. Scottish-American writer on horticulture. His *Gardening for Profit*, 1866, was widely circulated.

**Henderson,** RICHARD, 1734–1785. Pioneer in Ky. and Tenn., where he bought an immense tract from the Cherokees, half of Kentucky, and formed the Transylvania Co. 1775. Va. annulled this transaction.

**Henderson,** THOMAS, 1798–1844. Director Cape of Good Hope Observatory 1831; Astronomer Royal of Scotland 1834–44; discoverer of the parallax of $\alpha$ Centauri.

**Hendrick,** d. 1755. Mohawk chief, ally of Sir Wm. Johnson.

**Hendricks,** THOMAS ANDREWS, 1819–1885. M.C. 1851–55; U. S. Senator 1863–69; Gov. of Indiana 1873–77; Democratic candidate for the Vice-Presidency 1876; was elected 1884.

**Hengist,** d. 488, and **Horsa,** d. 455. Brothers, leaders of the JUTES (q.v.), who came to England 449 on invitation of King Vortigern to drive out the Picts and Scots. See KENT.

**Hengstenberg,** ERNST WILHELM, D.D., 1802–1869. German Lutheran, intense opponent of rationalism and republicanism; Prof. Berlin from 1828; ed. *Kirchenzeitung* from 1827.

His works carried much weight in England and the U. S. *Christology of O. T.*, 1829–35, tr. 1854–58; *Introduction to O. T.*, 1831–39, tr. 1847–48; Commentaries on the Psalms, Ecclesiastes. Ezekiel, and St. John; *Kingdom of God in O. T.*, 1869–71, tr. 1871–72.

**Henhawks.** Birds of the genera *Accipiter*, *Archibuteo* (Rough-legged hawk), and *Buteo* (Red-shouldered hawk). The last rarely, and the second never, takes chickens; they prey rather on noxious insects, mice, etc. *Accipiter* has its tarsus partly feathered, and scutellate in front only. Examples are

Rough-legged Hawk (*Archibuteo lagopus*).

*A. velox*, Sharp-shinned hawk, length 12 in., and *A. cooperi*, 18 in. Both are rufous on breast and dusky above, with dark bars on the tail. *Archibuteo* has its tarsus entirely feathered in front, while in *Buteo* it is scutellate both before and behind. These useful buzzards last mentioned should be protected.

**Henke,** Heinrich Philipp Konrad, 1752–1809. Prof. at Helmstadt from 1777. *Ch. History*, 6 vols., 1799–1808.—His son, Ernst Ludwig Theodor, 1804–1872, prof. at Jena and Marburg, wrote *Calixtus and His Time*, 1853–60; *Recent Ch. Hist.* 1874–78.

**Henle,** Friedrich Gustav Jacob, 1809–1885. Prof. of Anatomy at Zurich 1840, Heidelberg 1844, and Göttingen 1852; professional writer of high rank.

**Henley,** John, 1692–1759. English author, founder of an "Oratory" 1726.

**Henley,** William Ernest, b. 1849. British poet and critic, ed. *Scots Observer*, 1888–93. *Book of Verses*, 1888; *Views and Reviews*, 1890.

**Henley-on-Thames.** English town 36 m. above London, famous for the amateur regatta held here annually since 1839. Pop., 1891, 4,913.

**Henlopen,** Cape. See Cape Henlopen.

**Henna.** Reddish-brown substantive dye procured from the leaves of *Lawsonia alba*. Mohammedans of India, Persia and Arabia use the shoots for dyeing red the nails, tips of the fingers and toes, and palms of the hand. It is found in Egyptian mummies.

**Hennepin,** Louis, ab.1640–ab.1706. Flemish missionary to Canada 1675, who penetrated to the Falls of St. Anthony 1680. His *Louisiana*, 1683, *New Discovery*, 1697, and *New Voyage*, 1698, contain a mixture of truth and falsehood.

**Hennequin,** Alfred, 1842–1887. French dramatist.

**Henner,** Jean Jacques, b. 1829. French painter, especially of the nude.

**Hennersdorf.** In Prussia; scene of a victory of Frederick II. over the Saxons and Austrians, Nov. 23, 1745.

**Hennessy,** Henry, F.R.S., b. 1826. Prof. of Applied Science, Royal Coll. of Science, Dublin, 1874. Author of a memoir in synchronous temperatures and isotherms for the whole globe.

**Hennessy,** Sir John Pope, 1834–1891. M.P. 1859; Gov. of Bahama, Hong Kong, and other colonies.

**Hennin.** High horned female headdress of the 14th and 15th centuries. It sometimes rose to a height of 3 ft. and an enormous veil floated from its summit.

**Henningsen,** Charles Frederick, 1818–1877. English adventurer and artillerist of Swedish descent, engaged in Spain, Circassia, Hungary, and Nicaragua; Brig.-gen. C.S.A.; author of novels and books of travel.

**Henoch,** Eduard Heinrich, b. 1820. Prof. Berlin from 1858; writer on diseases of children.

**Henotheism.** Earliest form of Vedic or Hindu belief "in single supreme gods"; opposed at once to monotheism and to polytheism: term used by Max Müller 1878.

**Henotikon.** Decree of union issued by Zeno 482 to end the Monophysite controversy.

**Henricians.** Sect sprung from Henry of Lausanne, d. 1184; suppressed by St. Bernard.

**Henrietta Maria,** 1609–1669. Daughter of Henry IV. of France; queen of Charles I. of England 1625. After earning much unpopularity, she escaped to France 1644.—Her daughter, Henrietta, 1644–1670, became Duchess of Orleans 1661, and in 1670 secured the treaty of Dover from her brother, Charles II.

**Henry.** Unit of Self-Induction (q.v.).

**Henry I.,** "Beauclerc," 1068–1135. King of England 1100; son of William I. He seized and kept the throne in the absence of his brother Robert.

**Henry II.,** 1133–1189. King of England 1154; son of Geoffrey Plantagenet and Matilda, daughter of Henry II. From his father and his wife, Eleanor of Aquitaine, he acquired nearly half of France. His reign was marked by legal reforms, and disturbed by controversy with Thomas à Becket and the rebellion of his sons.

**Henry III.,** 1207–1272. King of England 1216; son of John. His misrule caused a rebellion; he was defeated at Lewes May 14, 1264, by Montfort, who called a Parliament Jan. 20, 1265.

**Henry IV.,** 1367–1413. King of England 1400; son of John of Gaunt and grandson of Edward III.; banished by Richard II. 1398. He returned 1399 and deposed Richard, establishing the House of Lancaster.

**Henry V.,** 1387–1422. King of England 1413; son of Henry IV. He won a great victory at Agincourt Oct. 25, 1415, married a French princess, Catherine, 1420, and continued his father's persecution of the Lollards.

**Henry VI.,** 1421–1471. King of England 1422; son of Henry V.; crowned King of France 1431; a weak and unfortunate monarch, whose armies were driven from France 1453 and worsted in the wars of the Roses, despite the heroism of his queen, Margaret of Anjou, by Edward of York, who was twice Protector, and finally deposed him. He was imprisoned 1465, restored by Warwick 1470, and after the battle of Tewksbury murdered in the Tower.

**Henry VII.,** 1457–1509. King of England 1485; descended from John of Gaunt and grandson of Owen Tudor; Earl of Richmond; attainted 1461. He defeated and killed Richard III.

Henry VII., Empson and Dudley.

at Bosworth 1485, and married Elizabeth of York 1486, uniting the factions. He was an able ruler and financier, and left an overflowing treasury chiefly through the extortions of his ministers, Empson and Dudley.

**Henry VIII.,** 1491–1547. King of England 1509; son of Henry VII. He married Catharine of Aragon 1509; was in-

volved in the war between Charles V. and Francis I.; opposed Luther 1521; deposed Wolsey 1529; executed Bp. Fisher, Sir Thomas More, Cromwell, his wives, Anne Boleyn and Catherine Howard, and many others; despoiled the monasteries, and made himself head of the English Church in place of the Pope. He was an imperious tyrant, whose divorce from Catherine led to vast results, and whose willfulness opened the door to the English Reformation. Froude and others have vainly endeavored to rehabilitate his memory.

**Henry I.,** 1005–1060. King of France 1031; son of Robert II.

**Henry II.,** 1519–1559. King of France 1547; son of Francis II.; husband of Catharine de' Medici 1533. Ruled by the Guises and other favorites, he was embroiled with Spain, Germany, and England, was defeated at St. Quentin 1557, and by the treaty of Château-Cambresis, 1559, gave up his conquests in Italy.

**Henry III.,** 1551–1589. Third son of Henry II.; King of Poland 1573, and of France 1574; notorious for frivolity in the early part of his reign, and pitiable in later years for his vain struggles against the aggressions of the Catholic League. Driven to extremity, and almost dethroned, he procured the murder of Guise Dec. 1588, secured the alliance of Navarre, and was soon assassinated by an emissary of the League. With him ended the House of Valois.

**Henry IV.,** 1553–1610. King of France 1589; son of Antoine de Bourbon and grandson of Henry, King of Navarre. He fought at Jarnac 1569; married Margaret of Navarre 1572, narrowly escaped the massacre of St. Bartholomew, and was held at Paris till 1576; led the Huguenots in all their wars and negotiations; became heir-presumptive 1584, but was excommunicated 1585; was bitterly opposed by the League after Henry III.'s death, and recognized by less than half of France; Cardinal Bourbon, his relative, was set up as Charles X. He won a great victory at Ivry, March 14, 1590, and besieged Paris; but

Henry IV. and his Family.

it was clear that the nation would not accept a Protestant king. At Rosny's advice he submitted to Rome 1593, and was crowned 1594. The war lasted till 1598; as soon as it was over he enforced toleration under the Edict of Nantes. He reformed the finances, initiated many improvements, and raised the country from its long depression. His life was attempted 19 times; his plan of armed intervention in the wars of Germany was foiled by the dagger of Ravaillac. Though pleasure-loving and licentious, he was wise, just, and merciful, a brilliant soldier, and a great ruler, a friend of progress and liberty, and the most picturesque figure of his time.

**Henry I.,** OF GERMANY, "THE FOWLER," 876–936. Duke of Saxony 912, King 919; conquered Lorraine 925. He warred with Slavs, Hungarians, and Danes, and died when about to assume the imperial title.

**Henry II.,** 972–1024. Duke of Bavaria 995; King of Germany 1002; Emperor 1014; canonized 1152. His day is July 15.

**Henry III.,** 1017–1056. King of the Germans 1026, Emperor 1039; son and successor of Conrad II.; a vigorous ruler, patron of learning, and builder of churches.

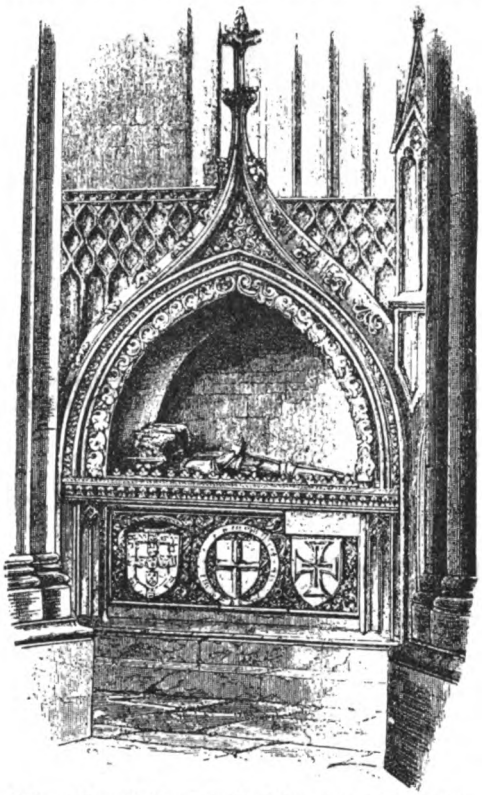
**Henry IV.,** 1050–1106. Son and successor of Henry III.; Emperor 1056, his mother being regent; involved in wars, and excommunicated 1076. His terrible humiliation by Gregory VII. at Canossa, Jan. 1077, was scarcely atoned for by his vengeance 1084. His sons rebelled and one of them dethroned and imprisoned him 1105.

**Henry V.,** 1081–1125. Son of Henry IV.; crowned 1111; thrice excommunicated.

**Henry VI.,** 1165–1197. Son of Frederick I. He basely imprisoned Richard I. of England, and with the ransom extorted from him started a new crusade.

**Henry VII.,** 1262–1313. Duke of Luxemburg; elected Emperor 1308; crowned in Rome 1312, while his troops were sacking the city; poisoned in Italy.

**Henry,** "THE NAVIGATOR," 1394–1460. Son of John I. of Portugal; founder of the school of navigation at Sagres, near



Prince Henry's Tomb in the Monastery of Balatha.

Cape St. Vincent, whence proceeded the powerful stimulus to maritime discovery.

**Henry,** OF PORTUGAL, 1512–1580. Abp. of Braga 1532; Grand Inquisitor 1539; Cardinal 1545; King 1578.

**Henry** THE LION, 1129–1195. Duke of Saxony 1146, and of Bavaria 1156; powerful and troublesome in Germany; practically deposed and exiled 1177.

**Henry,** OF HUNTINGDON. Archdeacon of Huntingdon ab. 1120. His *Historia Anglorum*, tr. 1853, extends to 1154.

**Henry,** CALEB SPRAGUE, D.D., LL.D., 1804–1884. Prof. Univ. New York 1839–52; tr. Cousin's *Psychology*, 1834. *Christian Antiquities*, 1837; *Hist. Philosophy*, 1841; *Dr. Oldham at Greystones*, 1860.

**Henry,** JOSEPH, LL.D., 1797–1878. Prof. Princeton 1832; Sec. Smithsonian Institution from 1846; founder of its system of voluntary meteorological observers. He established 1855 the first daily weather map by telegraphic reports and weather predictions, was author of investigations and lectures on Climatology, Thunderstorms and Magnetism, and principal promoter of meteorology in the U. S. His first important paper was *On some Modifications of the Electro-Magnetic Apparatus.* He was the first to show the difference between a "quantity" magnet and an "intensity" magnet with a long fine wire of many turns. He pointed out that the latter form only was suitable for telegraphic purposes. Early in 1832 he discovered the induction of a current on itself in a long coil of wire, greatly increasing the discharge. He was many times president of the National Academy of Sciences. His publications appeared chiefly in Silliman's Am. Journal of Science; Trans. Am. Phil. Soc.; Smithsonian Reports.

**Henry,** MATTHEW, 1662–1714. English commentator. His *Exposition of O. and N. T.*, 1704–10, though of no critical value, was long popular, and was highly praised by Whitefield, Doddridge, and Robert Hall.—His father, PHILIP, 1631–1696, ejected as a Nonconformist 1662, gained posthumous fame by his *Sermons* and *Remains.*

**Henry,** PATRICK, 1736–1799. Orator and patriot of the Revolution. He led the opposition to the Stamp Act in the Va. House of Burgesses; was Speaker of the first general Congress 1774, and Gov. of Va. 1776–79 and 1781–86. He was

elected to the Federal Convention of 1787, but refused to take his seat. He opposed the ratification of the Constitution by Va., on the ground that it unduly restricted the power of the

Patrick Henry.

several States. He was offered but declined the Secretaryship of State and the Chief Justiceship 1795, and a nomination as Minister to France 1799.

**Henry,** WILLIAM ARNON, b. 1850. American agricultural teacher and investigator, Prof. of Agriculture Univ. Wis., and Director Wis. Agricultural Experiment Station; contributor to the reports of that station and to various agricultural journals.

**Henry,** WILLIAM WIRT, b. 1831 in Va. Grandson and biographer, 1890, of Patrick Henry.

**Henry,** CAPE. In Va., at the entrance to Chesapeake bay.

**Henry's Law.** Principle followed approximately by all gases: that gases are dissolved in liquids in the ratios of the pressures under which they are exposed to the surface of the liquid. Thus the volume of each gas dissolved by a given quantity of liquid at a given temperature is always the same.

**Henryson,** ROBERT, ab.1425–ab.1495. Scottish poet, versifier of Æsop.

**Henselt,** ADOLF VON, 1814–1889. German pianist, composer of a concerto in F minor, which ranks with the best works of its kind; inspector of musical instruction in St. Petersburg.

**Henshaw,** HENRY WETHERBEE, b. 1850. Naturalist of U. S. Survey in Utah 1872; attached to Bureau of Ethnology 1879. *Report* (on ornithology), 1875; *Animal Carvings from Mounds*, 1886.

**Henson,** JOSIAH, 1787–1881. Supposed original of Mrs. Stowe's *Uncle Tom*, but denied by her.

**Henty,** GEORGE ALFRED, b. 1832. English writer of stories for boys, usually with a historical basis, and covering every part of the globe. Since 1867 he has produced over fifty popular and useful volumes.

**Hentz,** MRS. CAROLINE LEE (WHITING), 1800–1856, m. 1825. American novelist and dramatist. *Linda*, 1850; *Ernest Linwood*, 1855.

**Henwood,** WILLIAM JORY, 1805–1875. English mineralogist and geologist; student of the phenomena of ore deposits and of subterranean temperature.

**Hepar Sulphuris.** Brown substance used in medicine, consisting of the sulphate, thiosulphate, and polysulphides of potassium.

**Hepatica.** *Hepatica hepatica.* Common spring flower of the n. hemisphere, of the natural family *Ranunculaceæ;* also known as Liverleaf, and erroneously as Liverwort.

**Hepaticæ.** Class of *Bryophyta*, comprising the Liverworts, or Livermosses. They are small but beautiful plants, terrestrial or aquatic in habit, and of no economic importance.

**Hepatic Cæca.** Tree-like prolongations from the pyloric cæca of the starfish, its so-called liver.

**Hepatitis.** Inflammation of the liver; a rare affection with no clear symptoms.

**Hepato-Pancreas.** So-called liver of invertebrates. It functions more like a pancreas than a liver.

**Hepato-Portal.** System of vessels that carry the blood from the digestive organs into the liver.

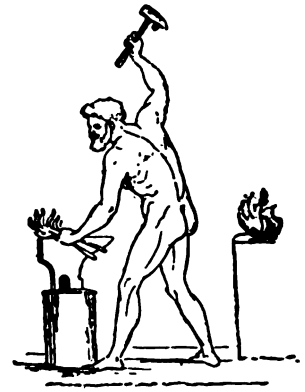
**Hepburn,** JAMES CURTIS, M.D., LL.D., b. 1815. American missionary in Japan 1859–92, author of an important Japanese dictionary 1872.

**Hephæstion,** 2d century. Alexandrian Greek, author of a *Manual of Meters.*

**Hephæstion,** d. 324. Comrade of Alexander, who gave him a memorable funeral at Babylon, and built temples for his worship.

**Hephæstus.** Greek god of fire, son of Zeus and Hera (or of Hera alone); born lame and weak, and flung from Olympus by his mother. Afterward hurled from heaven by Zeus, he fell a whole day, and alighted on Lemnos (being lamed by

Hephæstus (Vulcan). (From an Altar in the Vatican.)



Hephæstus (Vulcan). (From a Gem in the National Cabinet at Paris.)

this fall, according to later writers). His hobbling gait as he handed the nectar about amused the gods. He was a worker in metals, built the palaces in Olympus, and made armor for Achilles. Later, the Cyclopes were his workmen, and his shop was in some volcanic island. See VULCAN.

**Heppe,** HEINRICH LUDWIG JULIUS, 1820–1879. Prof. Marburg from 1850. He wrote much on Ch. history and the 15th century, including *Reformers of England and Germany*, tr. 1859, Lives of Melanchthon and Beza, and two books on Mysticism and Pietism 1875–79.

**Heptads.** In Chemistry, elements or radicals possessing a valence of seven.

**Heptagon.** Polygon of seven sides.

**Heptagonal Numbers.** Series of polygonal numbers which may be arranged to form heptagons and having the property that any one multiplied by forty and increased by nine gives a perfect square.

**Heptagynia.** Orders of plants which have seven pistils.

**Heptagynous.** Flowers with seven pistils.

**Heptameron.** Series of 72 tales by Margaret of Navarre, written ab. 1546 on the model of Boccaccio's *Decameron*, but less coarse; widely tr. and still read.

**Heptamerous.** Flowers constructed on the plan of seven members of each circle of parts; exceedingly uncommon.

**Heptandria.** Linnæan class of plants, including all those with seven stamens, such as the Horse Chestnut and Lizard's Tail.

**Heptandrous.** Flower with seven stamens.

**Heptane.** $C_7H_{16}$. Liquid hydrocarbon known in various isomeric forms. The normal heptane is a liquid boiling at 98° C., obtained from the ethereal oil of the nut pine and from petroleum. It constitutes a large portion of the commercial gasoline and naphtha.

**Heptaphyllous.** Calyx or corolla composed of seven leaves (sepals or petals).

**Heptarchy.** Seven Saxon kingdoms: Kent, Sussex, Wessex, Essex, East Anglia, Mercia, and Northumbria; gradually formed in England from 455; united under Egbert, who became sole ruler 828.

**Heptateuch.** First seven books of O. T.

**Heptyl Alcohol.** $C_7H_{15}.OH$. Bpt. 175° C. Œnanthic alcohol. Liquid prepared by the action of hydrogen upon œnanthol.

**Heptylene.** $C_7H_{14}$. There are several isomer of this formula. Normal heptylene is a liquid boiling at 98°–99° C., made from chlorheptane by heating with potassium acetate and glacial acetic acid.

**Hepworth,** GEORGE HUGHES, D.D., b. 1833. American divine, journalist and author.

**Hera.** Daughter of Cronos, sister and wife of Zeus, who heard her counsels and trusted her with his secrets, but required obedience. Homer represents her as jealous and quarrelsome, siding with the Greeks against Troy, and persecuting all the children of Zeus by mortal mothers. She was goddess of marriage and childbirth, and identical with Roman Juno.

Hera (Ancient Marble in the Villa Ludovisi, Rome).

**Heracleia.** Ancient city of s. Italy, founded by Greeks ab. 432 B.C.; scene of Pyrrhus' costly victory over the Romans 280 B.C. His loss was 13,000; that of the Romans 15,000.

**Heraclidæ.** Descendants of Hercules. With the Dorians they conquered Peloponnesus 80 years after the downfall of Troy. This is often called their Return, as they were by descent Achæans.

**Heraclides Ponticus,** 4th century B.C. Greek writer on various subjects, little of whose work remains.

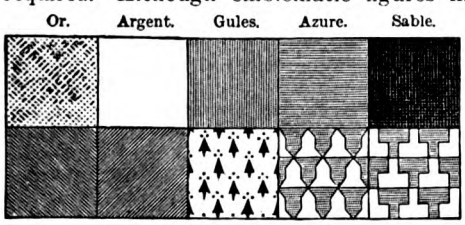
French Heralds—1500.

**Heraclitus,** OF EPHESUS, ab. 535–475 B.C. Greek philosopher of Ephesus, celebrated for his doctrine of Becoming or change, in which he maintained that there was nothing eternal, and opened the way for later philosophic skepticism.

**Heraclius,** ab. 575–641. Emperor of the East 610, having revolted against Phocas. He conquered Persia 622–627, but later lost it, with Syria and Egypt, to the followers of Mohammed, while he was absorbed by luxurious indulgence in Constantinople.

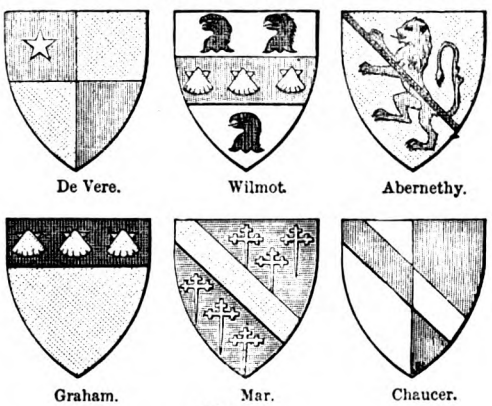
**Herald.** In ancient times an official messenger. The duties of the Mediæval herald were to carry messages or challenges between kings or lords, to proclaim war and peace, to announce trials by combat and tournaments, to lay out the lists, witness the combats and record the names of the most valiant, to number and register those slain in battle, and to regulate and supervise the bearing of coat-armor, the marshaling of processions, and all other state ceremonies.

**Heraldry.** Knowledge of the duties of the Herald refers more specifically to the laws which regulate armorial insignia. It seems to owe its rise in the need of some means of distinguishing warriors concealed by armor. The shield as the most conspicuous part of the armor naturally lent itself to the purpose required. Although emblematic figures have been




Tinctures.

found in Egypt, China, India, Japan, and on Greek coins, yet there is much to prove that armorial devices properly so called were not used before the middle of the 12th century. Beginning with France and Germany their use spread rapidly throughout Europe, largely as a result of the international intercourse brought about by the Crusades. They were seen in the third crusade (1189), and in that century originated the fleurs-de-lis of France and the lions or leopards of England. At first every knight seems to have assumed what arms he pleased, but conflicts made some regulation necessary. In England in 1483 the matter was placed in charge of the Herald's College, and in most countries in Europe, with the exception of France, direct supervision of armorial insignia is the rule. A coat-of-arms is composed of charges, or figures, depicted on an escutcheon, which originally curved to encircle the body. They are distinguished from each other not only by

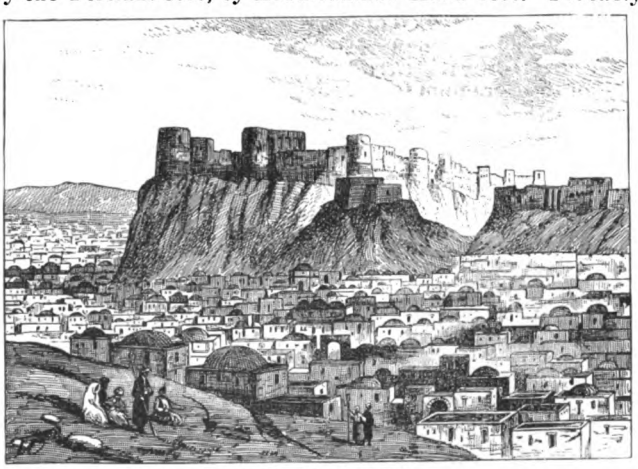



Blazonry.

their charges but also by the color of the charges and of the field. The surface of the shield may be of a metal, of a fur, or of a tincture. The metals are gold (or) and silver (argent); the tinctures are red, blue, black, green, and purple, or gules, azure, sable, vert, and purpure; and the furs, ermine and vair, the latter being taken from the fur of a squirrel, bluish-gray above, and white beneath. For uncolored heraldic engravings it has been necessary to invent an arbitrary system of signs as seen in the figures.

**Herald's College.** Corporation who decide what heraldic bearings are properly worn, and to grant new ones. It was first instituted by Edward IV. 1464, chartered by Richard III. 1483, and rechartered by Mary 1554.

**Herat.** City of w. Afghanistan, on the Hari-rud; styled the Key of India, because of its strategic importance; taken by the Persians 1856, by Abdurrahman Khan 1881. Probably



The Citadel of Herat.

no city in central Asia has sustained so many sieges and been so often destroyed. This is believed to be the seventh city on the same site. Pop. ab. 30,000

**Heraud,** JOHN ABRAHAM, 1799–1887. English dramatist, author of the tragedies *Salavera* and *Videna*, and of the poems, *Descent into Hell*, *Judgment of the Flood*, and *Uxmal*, 1877.

**Herb.** Plant whose stem dies down to or near the ground at the close of the flowering season.

**Herbaceous.** Resembling or pertaining to an herb; also having green tips to the bracts of the involucre of plants of the Composite family.

**Herba Impia.** *Filago germanica.* Low plant of the natural family *Compositæ*, native of Europe, naturalized in the U. S.; known also as Cotton Rose.

**Herbarium.** Collection of dried plants, properly labeled and arranged for consultation.

**Herbart,** JOHANN FRIEDRICH, 1776–1841. German philosopher, prof. at Göttingen 1805–9 and from 1833; at Königsberg 1809–33. His philosophy was realism as opposed to the idealism of Hegel. His principal work was in the field of pedagogy, wherein he was the founder of modern methods; *Psychologie*, 1816–24; *Metaphysik*, 1828–29; *Works*, 12 vols., 1850–52.

**Herbelot,** BARTHÉLEMY D', 1625–1695. French Oriental scholar whose great work, entitled *Bibliothèque Orientale*, 1697, is still of value.

**Herbert,** GEORGE, 1593–1633. English sacred poet. *The Temple*, 1633, is a classic. He left a prose work, *A Priest to the Temple*, 1652.—His brother, EDWARD, Lord Herbert of Cherbury, 1583–1648, ambassador to France 1618–24, was the defender of common sense in philosophy, and in time and eminence first of the English deists. He wrote two Latin treatises, *On Truth*, 1624, and *Religion of the Nations*, 1645, tr. 1705.

George Herbert.

**Herbert,** HENRY WILLIAM ("FRANK FORESTER"), 1807–1858. Anglo-American novelist, translator, and writer on field sports.

**Herbert,** HILARY ABNER, b. 1834. M.C. from Ala. 1877–93; Sec. U. S. Navy 1893.

**Herbert,** SIDNEY, 1810–1861. M.P. 1832; thrice Sec. of War, introducing sundry reforms; organizer of the volunteer force; Baron 1861.

**Herbert,** VICTOR, b. 1859 in Dublin. Violoncello virtuoso and composer, educated in Stuttgart; author of the comic operas, *Prince Ananias*, 1894, and *The Wizard of the Nile*, 1895.

**Herbivora.** See DIPLARTHRA.

**Herbort von Fritzlar,** 13th century. German author of an epic on the Trojan war.

**Herb-Robert.** *Geranium robertianum.* Red-flowered herb of the Geranium family, native of the n. hemisphere.

**Hercher,** RUDOLF, 1821–1878. German editor of sundry Greek classics.

**Hercogamous.** Hermaphrodite flowers in which there is some mechanical prevention of self-fertilization.

Farnese Hercules (Marble Statue found in the Baths of Caracalla, Rome).

**Herculaneum.** Ancient city of Campania, 4 m. e. of Naples, under the modern town of Resina; originally a Greek colony; buried by the lava of Vesuvius 79; discovered 1719. Excavations are now at a standstill, and have never been conducted systematically, owing to the difficulty of working through the lava. The finest bronzes of the Naples Museum and many other interesting antiquities are from this site.

**Herculano de Carvalho e Aranjo,** ALEXANDRO, 1810–1877. Portuguese historian, novelist, and poet.

**Hercules,** or HERACLES. Most famous of ancient heroes, son of Zeus and Alcmene. The twelve labors set him by Eurystheus were: 1, slaying the Nemean lion; 2, killing the hydra of Lerna; 3, catching the Arcadian stag; 4, hunting the Erymanthian boar; 5, cleansing the stable of Augeas; 6, destroying the Stymphalian birds; 7, capturing the Cretan bull; 8, carrying off the mares of Diomedes; 9, fetching the girdle of queen of the Amazons; 10, capturing the oxen of Geryon; 11, stealing the golden apples of the Hesperides; 12, bringing Cerberus from lower world. He also brought Alcestris back from Hades, and unchained Prometheus, whom Zeus had bound. He died in agony from the poisoned shirt of Nessus, innocently given him by his wife.

**Hercules,** PILLARS OF. See PILLARS OF HERCULES.

**Hercules' Club.** *Zanthoxylum clava-herculis.* Spinose tree of the natural family *Rutaceæ*, native of tropical America; also *Aralia spinosa*, a spiny tree of the natural order *Araliaceæ*, native of the s. e. U. S.; known also as Angelica tree.

**Hercynian Forest.** Wooded range of mountains in central and s. Germany, which, according to Cæsar, measured 9 days' journey one way by 60 the other. See HARZ.

**Herder,** JOHANN GOTTFRIED, 1744–1803. German critic and poet, court preacher at Weimar from 1776. *Fragments on German Literature*, 1767; *Critical Forests*, 1769; *Origin of Language*, 1771; *Spirit of Hebrew Poetry*, 1782, tr. 1833; *Philosophy of History*, 4 vols., 1784–91, tr. 1803. He exerted vast influence on Goethe and on modern literature. His *Cid* and other poems are much admired.

**Herder,** SIEGMUND AUGUST WOLFGANG, FREIHERR VON, 1776–1838. Director of the Royal Saxon Mines and of the Mining Academy at Freiberg; wrote a valuable treatise on the proposed deep drainage adit for the Freiberg mines.

**Herderite.** $CaF(BePO_4)+H_2O$. Beryllium phosphate, with calcium fluoride and water, occurring in Saxony, and Stoneham, Me.

**Herd's Grass.** See TIMOTHY and REDTOP.

**Heredia,** JOSÉ, MARIA DE, b. 1842. French poet of Cuban birth, elected to the Academy 1894.

**Heredia,** PEDRO DE, ab. 1500–1555. Spanish Gov. of New Andalusia (now part of Colombia) 1530; founder of Cartagena 1533.

**Heredia y Campuzano,** JOSÉ MARIA DE, 1803–1839. Cuban poet, dramatist, and translator, exiled 1823, settled in Mexico 1825. His works are highly valued in Spain. *Universal History*, 1830–31.

**Hereditaments.** Whatever pass by law to the heir; corporeal are tangible and can pass by livery; incorporeal pass by grant, as franchises, commons, and ways.

**Heredity.** Transmission of biological and psychical characters from parents to offspring; also the qualities so transmitted, the law by which the transmission takes place, and the science which treats of these laws. In a broad sense this term covers the facts of variation as well as of resemblance. The principle of inheritance is a fundamental one in the theory of evolution and development, standing in opposition to the tendency of organisms to vary under the influence of environment. There is, however, considerable difference of opinion among biologists in accounting for the transmission of the advances of previous generations, one school holding that the operation of natural selection upon congenital variations is sufficient to explain all progress, while another group contends that it is necessary to assume the transmission of acquired as well as congenital characters. See DARWINISM, DEVELOPMENT, VARIATION, PANGENESIS, PERIGENESIS, WEISMANN'S THEORY, BROOKS'S THEORY, IDIOPLASM, and PSYCHIC THEORY.

**Hereford.** See CATTLE.

**Heresy.** Originally partisanship; then false doctrine factiously maintained. Its application is merely abusive, as Philaret of Moscow remarks, except to doctrines which have been condemned by the undivided Church. Jeremy Taylor placed it in the temper rather than the opinions. Popularly it signifies every tenet which contradicts our own.

**Hereward,** 11th century. Last Englishman to submit to William the Conqueror; celebrated by C. Kingsley in his novel, 1866.

**Hergenröther,** JOSEPH, D.D., 1822–1890. Prof. Munich 1852; called to Rome 1868, Cardinal 1879. *Photius*, 1867–69; *Anti-Janus*, 1870; *Catholic Ch. and Christian State*, tr. 1876; *Ch. History*, 1876–80.

**Hergest,** RED BOOK OF. MS. volume of Welsh romances, dating ab. 1300–1450.

**Her-hor,** or SMENDES. Founder of the 21st Egyptian dynasty, ab. 1100 B.C. His inscriptions were found at Karnak.

**Hering,** CONSTANTINE, 1800–1880. German-American writer on homeopathy.

**Hering,** EWALD, Ph.D., b. 1834. Prof. at Vienna and Prague; writer on physiology and physics.

**Hering,** RUDOLPH, b. 1847. American civil engineer, designer of many water supply and sewage works; *Flow of Water*, 1889.

**Heriot.** Best chattel of a defunct tenant, still claimable in cases of copyhold by the lord of the manor.

**Herisson.** Revolving beam, armed like a hedgehog with spikes outward, serving as a barrier to passages, gates, and doors of any fortified place which are frequently opened.

**Herist,** GEORGE, 1563–1624. Scottish goldsmith, court jeweler in London from 1603; founder of a school in Edinburgh, now devoted to technical instruction.

**Herist,** JOHN, 1760–1833. Scottish novelist and journalist.

**Herkimer,** NICHOLAS, ab. 1720–1777. Brig.-gen. of N.Y. troops 1776; fatally wounded at Oriskany.

**Herkomer,** HUBERT, b. 1849. German-English painter, best known by his portraits and etchings. His *Last Muster* was at the World's Columbian Exposition, Chicago, 1893.

At the Well, by Herkomer.

**Hermæ.** Pillars surmounted by a head of Hermes (Mercury), erected as sign-posts at cross-roads; placed also outside houses in Athens to cheer parting travelers. The historic mutilation of the Hermæ in Athens occurred May, 415 B.C.

**Hermandad.** Leagues formed in Spain to maintain the public peace in Aragon ab. 1250, 1295, and later; reorganized 1488 to protect the people against the nobles.

**Hermann.** See ARMINIUS.

**Hermann,** FRIEDRICH BENEDICT WILHELM, 1795–1868. Political economist, prof. Munich 1833. *Staatswirthschaftliche Untersuchungen*, 1832.

**Hermann,** JOHANN GOTTFRIED JACOB, 1772–1848. Prof. Leipzig 1803; critic and investigator in Greek; pioneer in the modern study of classics, especially in the meters of ancient poetry.

**Hermann,** KARL FRIEDRICH, 1804–1855. Prof. Göttingen 1842; writer on Greek antiquities.

**Hermann,** LUDIMAR, b. 1838. Prof. Zurich 1868; writer on physiology and toxicology.

**Hermann,** NICOLAUS, d. 1561. German hymnist.

**Hermann-Léon,** CHARLES, b. 1838. French painter, especially of animals.

**Hermaphrodite.** (1) An organism or (2) sexual condition of an organism in which both ovaries and spermaries (testes) are present and functional. This is normally the rule in some Barnacles, some Snails (*Euthyneura*), and many Worms; but rarely if ever are the ova fertilized by sperms from the same parent. Self-fertilization is prevented usually by the fact that the two sorts of germ-cells become mature at different times. Most animals of one sex have a hermaphroditic stage in their development, and thus teratologically we may get insects and vertebrates that have one side of the body of one sex and the other of the opposite, due to a lack of harmony in the development; or certain parts of the female sexual system which usually remain rudimentary in the male may become over-developed; or the male accessory organs remain simultaneously rudimentary, and corresponding changes may occur in the female. True hermaphrodites of this class have both ovaries and testes. If the accessory organs only are involved, it is a case of false hermaphroditism. Among the *Protozoa* (*Ciliata*) are certain forms in which mutual copulation takes place, and it was once erroneously believed that the endoplast was the female, the endoplastule the male organ. So that permanent and periodic hermaphrodites among these animals were distinguished according as the nucleolus was permanently present or developed only during copulation. Hermaphroditism is normally never found in higher animals, though rudimentary organs of both sexes are sometimes observed. See CONJUGATION.

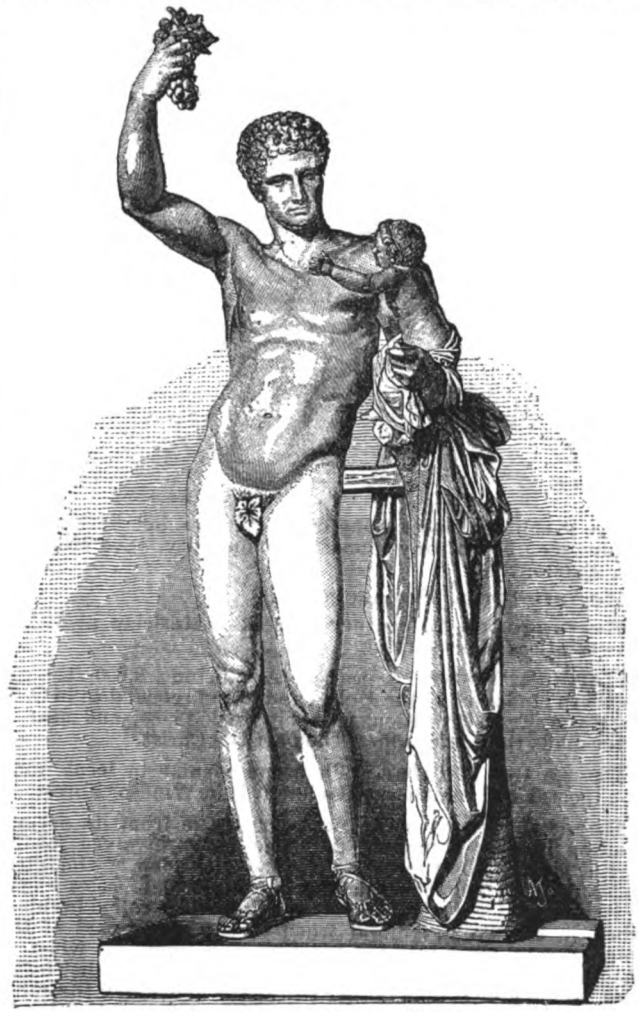
**Hermaphrodite.** Flowers in which both stamens and pistils are present; called also bisexual.

**Hermaphroditus.** Son of Hermes and Aphrodite. The nymph of the fountain Salmacis embraced him as he was bathing; pursuant to her prayer, both sexes were joined in his person.

**Hermas.** Author of a remarkable allegory of the early church, *The Shepherd*, once esteemed almost or quite canonical. Its date is probably between 70 and 150.

**Hermeneutics.** Interpretation, especially of Scripture; always pursued in the Ch.; divided into philological, doctrinal, and practical or homiletic.

**Hermes.** Greek divinity, son of Zeus and Maia; thief of Apollo's oxen a few hours after his birth; herald of Zeus; conductor of the dead to the lower world; god of eloquence, of cunning, fraud, and theft, of roads and commerce; patron of gymnastic games; inventor of the lyre, the alphabet, music, and measures; originally worshiped in Arcadia. He wears a winged hat and winged sandals, and bears the herald's staff. See MERCURY.



Hermes, by Praxiteles (restored).

**Hermes,** GEORG, 1775–1831. R. C. prof. at Münster 1807, Bonn 1819. His *Inner Truth of Christianity*, 1805, *Christian-Catholic Theology*, 1819–29, and *Dogmatics*, 1834, appealed to reason rather than authority. He exerted much influence, but his central idea was condemned by the Pope 1835.

**Hermes,** JOHANN TIMOTHEUS, 1738–1821. German novelist, prof. at Breslau. *Fannie Wilkes*, 1766.

**Hermesionax,** d. ab. 300 B.C. Of Colophon; Greek writer of erotic elegy, of whose work we have a considerable fragment.

**Hermes Trismegistus.** Egyptian Thoth, scribe of the gods, "lord of the divine words," inventor of speech, writing, religion, geometry, etc.: reputed author of the sacred books called by the Greeks "Hermetic," which, according to Clement of Alexandria, numbered 42, and treat of deities, sacrifices, laws, prayers, astronomy, medicine, etc. By 300 his name had become a convenient pseudonym to set at the head of works on Neo-Platonism and cabalistic theosophy. Pillars covered with alchemistic signs were erected to him in Egypt. His name was mentioned by Tertullian ab. 195.

**Hermetic Books.** See HERMES TRISMEGISTUS.

**Hermias,** d. 344 B.C. Tyrant of Atarneus, n.w. Asia Minor, 347 B.C.; host and brother-in-law of Aristotle, who honored his memory.

**Hermione.** Daughter of Menelaus and Helen; wife of Neoptolemus, and then of his slayer Orestes.

**Hermippus.** 1. Playwright of Athens, 5th century B.C. 2. Smyrniote biographer of Greek authors, ab. 210 B.C., supplementing the work of Callimachus. 3. Syrian biographer of noted slaves.

**Hermitage.** Palace in St. Petersburg, devoted to the uses of a museum and picture gallery. Its antiquities from the sites of ancient Greek colonies in the Crimea are unique.

**Hermit,** or EREMITE. Inhabitant of a desert. The name was given to such religious persons who retired from society

Hermits from Ill. MS. ab 1380 (British Museum).

to live in solitary places alone or in colonies, but without becoming members of any monastic community. See MONACHISM, ANCHORITES.

**Hermit Crab.** See ANOMOURA.

**Hermogenes,** 2d century. Greek rhetorician at Rome. Five treatises of his survive.

**Hermon,** MOUNT. S. peak of Antilibanus, 9,000 ft. high; northern landmark of the Holy Land, often referred to in O. T. Here the Transfiguration probably took place, and near it Peter made the confession, "Thou art the Christ."

**Herne the Hunter.** Phantom popular in local tradition, poetry and romance. His haunt is in Windsor Forest.

**Hernia.** Escape of an organ or tissue from its normal position in such a manner that the parts involved form a sort of sac; usually rupture or passage of a loop of the intestine out of the abdomen, pushing the skin and muscles ahead of it, so as to form a soft elastic swelling. It is called inguinal when in the groin, femoral when in the upper part of the thigh, scrotal when into the scrotum, and umbilical when at the umbilicus or navel. It is also found in many other localities, which give it many other titles; the above are the most common and most important. It is almost invariably due to congenital weakness of the abdominal wall at the point of occurrence, though a violent strain may cause it. It becomes strangulated when the return of the intestines into the abdomen is impossible; under such conditions death may result from obstruction of the intestine or gangrene. It may ordinarily be cured, if taken in time, by a properly fitting truss, or by an operation which closes the opening in the abdominal wall.

**Hero.** See LEANDER.

**Hero,** or HERON, 3d century B.C. Greek mechanician and inventor, of Alexandria, writer on pneumatics and geometry. See HERO'S FOUNTAIN.

**Herod,** THE GREAT, 62 B.C.-A.D. 1. Son of Antipater, an Edomite. By Roman influence he set aside the Maccabean family and was made King of Judea 37 B.C. His rule was vigorous, politic, jealous, and cruel.—His sons, ARCHELAUS and HEROD ANTIPAS, succeeded to portions of his power; the latter executed John Baptist, mocked Christ, and was exiled 39.—HEROD AGRIPPA I. reigned 37–44; his son and namesake, King of Chalcis 50, encountered St. Paul 60. See AGRIPPA.

**Herodes Atticus.** See ATTICUS.

**Herodians.** Jewish sect, adherents of the Herods.

**Herodianus,** AELIUS, 2d century. Alexandrian grammarian at Rome. Abstracts of several of his works have come down. He was considered one of the greatest of the ancient investigators of grammar.

**Herodianus,** 3d century. Greek author of an extant history of Rome in 8 books extending 180–238.

**Herodii** (CULTIROSTRES, CICONIÆ, HERODIONES, PELARGOMORPHÆ, ARDEIDÆ; HERONS and STORKS). Family of *Grallatores*, of large body, having long, naked legs, a powerful beak without cere, with hard, sharp edges, and sometimes curved at the point. The hind toe rests on the ground, the feet being colligate. Here belongs also the IBIS (q.v.).

**Herodotus,** b. 484 B.C. "Father of History," b. at Halicarnassus in Caria. He traveled over a large portion of the ancient world, settling finally at Thurii in Italy, where he finished his great history, in nine books, which recounts the struggles of the Greeks down to the final repulse of the Persians. In the course of it he makes numerous long digressions, wherein he gives the history of nations as they enter into relations with the main actors in the history: thus the second book treats of Egypt; Babylon too is described at length. While the work is thus discursive, the narrative is told in a charming style and contains a vast store of information regarding the early history of the nations concerned. It is written in the Ionic dialect. The best English translation is that of G. Rawlinson, 4 vols., 1875.

Herodotus (Naples Museum).

**Heroes.** Leaders of the Greeks in the Heroic Age, or mythical period preceding the dawn of history; often sons of gods, and generally objects of worship; celebrated by Homer, and prominent figures in ancient poetry and legend.

**Heroic Verse.** In Greek and Latin, hexameter; in French, iambic hexameter; in English, German, and Italian, iambic pentameter or blank verse; vehicle for epics.

**Heroic Virtues.** Such as transcend the range of ordinary duty and common characters, involving great fortitude or courage, combined with self-devotion.

**Hérold,** LOUIS JOSEPH FERDINAND, 1791–1833. French composer of operas. *Marie*, 1826; *Zampa*, 1831; *Le Pré aux Clercs*, 1832.

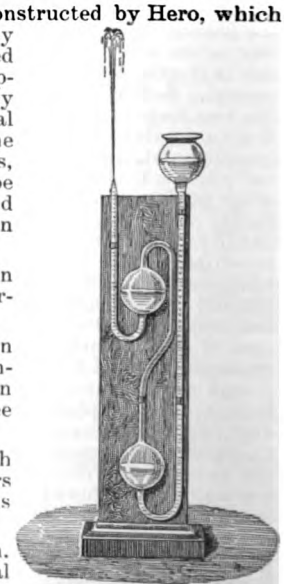
**Heron,** MATILDA, 1830–1877. Anglo-American actress.

**Herondas,** 3d century B.C. Greek realistic dramatist, whose Mimiambi were but recently discovered, and pub. 1891.

**Herons.** See ARDEIDÆ.

**Herophilus,** 3d century B.C. Physician of Alexandria, introducer of vivisection.

**Hero's Fountain.** Device constructed by Hero, which depends for its action on the elasticity of the air. It consists of two closed vessels, one above the other, the upper partly filled with water. They are so joined by a system of vertical tubes that, if water be poured into the lower globe through one of these tubes, the water in the upper one will be forced out through a vertical pipe and will rise to a height depending upon the dimensions of the instrument.



Hero's Fountain.

**Herostratus.** Victim of vain ambition, who fired the temple of Artemis at Ephesus 356 B.C.

**Herpes.** Disease of the skin, in which small vesicles, usually containing fluid, occur. A fever sore on the lip is a familiar example. See SHINGLES.

**Herpetology.** Science which treats of Reptiles. The earlier authors uniformly included the Batrachians with the reptiles.

**Herrera.** Village in Aragon, Spain. Scene of a defeat of royal troops by Don Carlos, 1837.

**Herrera,** FERNANDO DE, 1534–1597. Spanish lyric poet, one of the two greatest, the other being Luis de Leon.

**Herrera,** FRANCESCO, 1576–1656. Spanish painter; as was also his son, FRANCESCO. 1622–1685.

The Elevation of St. Francis, by Herrera (Seville).

**Herrera y Tordesillas,** ANTONIO DE, ab. 1555–1625. Spanish historian of America from its discovery to 1554, and of *The World in the Time of Philip II.*, 1601–15.

**Herrick,** ROBERT, 1594–1674. English poet, noted for the beauty of his lyrics; Vicar of Dean Prior, Devon, 1629–48, and from 1660. *Hesperides*, 1648. His *Noble Numbers*, 1647, are of more serious character and less known.

**Herrig,** HANS. 1845–1892. German dramatist and poet. *Jerusalem*, 1874; *Nero*, 1883.

**Herring.** See ISOSPONDYLI and CLUPEIDÆ.

**Herrings,** BATTLE OF THE. Convoy of Lenten provision, mainly salted herrings, sent from Paris under the escort of Sir John Fastolfe, for the English troops besieging Orleans, was attacked by 5,000 French cavalry, who were repulsed, Feb. 1429.

**Herring-bone Work.** Brickwork or stonework laid diagonally, as often employed in a band traversing a wall or in the filling of the arched heads of windows or doorways. In brickwork, the bricks are often allowed to project, or are laid in ornamental patterns.

**Herrnhut.** Village in Saxony, chief seat of the Moravians, who founded it 1722.

**Herron,** FRANCIS JAY, b. 1837. Major-gen. U. S. Vols. 1862–65, serving in the West.

**Herron,** GEORGE D., D.D., b. 1862. Prof. Iowa Coll. 1893. *The Larger Christ*, 1892; *The Christian State*, 1895.

**Herschel,** CAROLINE LUCRETIA, 1750–1848. Sister of Sir William, and his most efficient and faithful assistant during his whole life; discoverer of 7 comets and of many nebulæ; editor of a catalogue of 2,500 nebulæ discovered by her brother.

**Herschel,** CLEMENS, b. 1842. Civil and hydraulic engineer. *Road Making*, 1870; *Continuous Drawbridges*, 1875.

**Herschel,** SIR FREDERIC WILLIAM, D.C.L., F.R.S., 1738–1822. Most famous of English astronomers, originally a musician; knighted 1816. With telescopes constructed by himself he made many astronomical discoveries, including the planet Uranus and two of his satellites, two of the satellites of Saturn, Mimas and Enceladus, and a large number of nebulæ and double stars. Perhaps the greatest of all his discoveries was that of the physical connection of the binary stars. He contributed greatly to the knowledge of the determination of the true mechanism of the universe, but the problem, in the form in which he attempted it, remains unsolved.—His son, SIR JOHN FREDERIC WILLIAM, D.C.L., F.R.S., 1792–1871, knighted 1831, was a worthy successor of his illustrious father. He made valuable contributions to astronomy, mathematics, and chemistry. A number of popular works by him have had a deservedly great reputation, particularly the *Outlines of Astronomy* and *Familiar Lectures on Scientific Subjects*. He also wrote a treatise on Meteorology, and invented the Actinometer. See HERSCHEL'S ACTINOMETER.

**Herschel,** GEORG, b. 1850. German baritone singer, composer, and conductor of the Boston Symphony Orchestra 1881–84, and later of the London Symphony Concerts.

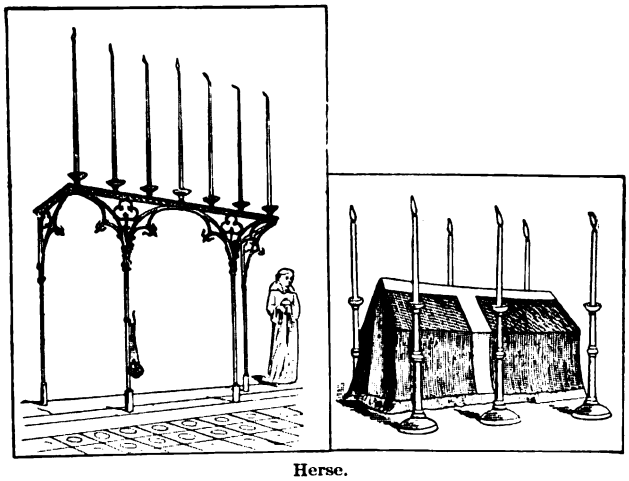
**Herschelian Rays.** Ultra violet parts of the spectrum, discovered and studied by F. W. Herschel.

**Herschelian Telescope.** Reflecting telescope with the eye-piece in front. The observer stands with his back to the object which he is examining and looks directly down the tube through the eye-piece.

**Herschell,** FARRER, b. 1837. M. P. 1874, knighted 1880, Baron 1886, High Chancellor 1886 and 1892.

**Herschel's Actinometer.** Glass cylinder containing solution of sulphate of copper, whose rate of expansion can be accurately measured, for determining the amount of heat received from the sun.

**Herse,** or HEARSE. Metal framework on which lighted candles were placed at the obsequies of distinguished persons;



Herse.

also a frame, usually of light woodwork, set over the coffin and covered with a pall; also the carriage in which the dead are transported.

**Hersent,** LOUIS, 1777–1860. French historical painter.

**Hersent-Hildevert,** PIERRE, b. 1827. French civil engineer.

**Hersillon.** Plank or beam 12 ft. long driven full of spikes or nails to incommode the march of infantry or cavalry.

**Hertha.** Popular name for the Teutonic deity identified with Mother Earth.

**Hertz,** HEINRICH RUDOLF, 1857–1894. Prof. of Physics at Bonn 1889; best known through his magnificent series of researches on electrical waves. His paper on *Rapid Electric Oscillations*, 1887, was the first of this series of investigation which appeared in Wiedemann's *Annalen*, 1887–90. In these he showed that electromagnetic actions are propagated with finite speed through space.

**Hertz,** HENRIK, 1798–1870. Dramatist and poet, founder of the new comedy in Denmark; b. a Jew, baptized 1832. *Epistles from Paradise*, 1830; *Svend Dyring's House*, 1837; *King Rene's Daughter*, 1845, tr. 1850.

**Hertz,** MARTIN JULIUS, b. 1818. Prof. Breslau 1862; editor of Livy, A. Gellius, and Horace.

**Hertz,** WILHELM, b. 1835. German poet and critic.

**Hertzen,** ALEXANDER, 1812–1870. Russian author, living in London 1851–65, and then at Geneva. His paper, *Kolokol*, had great influence from 1857. *Dilettanteism in Science*, 1842; *Dr. Krupof*, a novel, 1847; *Revolutionary Ideas in Russia*, 1851; *Baptized Property* (serfs), 1853; *Prison and Exile*, 1854–55; *New Phase of Russian Literature*, 1864.—His son, ALEXANDER, b. 1834, prof. at Lausanne since 1881, has pub. much on physiology. *Free Will*, 1870; *The Brain*, 1886.

**Herull.** Teutonic tribe from the Danube, active in central Europe from ab. 280 till overthrown by the Lombards ab. 512.

**Hervás y Panduro,** LORENZO, 1735–1809. Spanish-Italian writer in several fields, especially philology and cosmography. *Idéa del' Universo*, 21 vols., 1778–87.

**Hervé** (FLORIMOND RONGER), 1825–1892. French composer of operas bouffe. *Le petit Faust*.

**Hervé,** AIMÉ MARIE ÉDOUARD, b. 1835. French author and journalist, Academician 1886. *A Page of Cotemporary History*, 1869; *Irish Crisis*.

**Hervey,** JAMES, 1714–1758. English divine and author. His *Meditations among the Tombs*, 1746, was long popular. *Theron and Aspasio*, 1753–55.

**Hervey** (or COOK) **Islands.** In the Pacific Ocean s.w. of Society Islands. The largest is ab. 25 m. in circumference. Under British protection since 1888. They produce cotton, coffee, copra and oranges. Pop. ab. 2,500.

**Herwarth von Bittenfeld,** KARL EBERHARD, 1796–1884. Prussian general, prominent in the wars with Denmark and Austria, especially at Königgrätz, July 3, 1866; field-marshal 1871.

**Herwegh,** GEORG, 1817–1875. German lyric poet.

**Herz,** HENRI, 1806–1888. Pianist and composer, b. in Vienna; prof. Paris 1842–74; visited U. S. 1845.

**Herzberg,** EWALD FRIEDRICH, 1725–1795. Prussian official Prime Minister of Frederick II.; ennobled 1787.

**Herzegovina.** S. of Bosnia and e. of Dalmatia; conquered by the Turks 1483; province of Austria-Hungary since 1878, together with Bosnia and Novi-Bazar. Its area is 3,500

Turkish Muleteers in the Herzegovina.

sq. m. The inhabitants are Slavs, and engaged in agriculture and cattle raising. They are Mohammedans, Greek-Orthodox, and Roman Catholics.

**Herzen.** See HERTZEN.

**Herzog,** JOHANN JAKOB, D.D., 1805–1882. Swiss theologian, prof. at Lausanne 1835, Halle 1847, and Erlangen 1854–77; ed. *Religious Encyclopædia*, 22 vols., 1854–68, tr. by Dr. P. Schaff and others 1882–84. *Calvin and Œcolampadius*, 1843; *The Waldenses*, 1853; *Ch. History*, 1876–82.

**Hesiod,** ab. 9th century B.C. Earliest Greek didactic poet. His *Works and Days* contains maxims and rules in a simple style. The *Theogony* gives the genealogies and legends of the Greek gods. A series of smaller works, placed with the above, are probably from other hands and are mere imitations.

**Hesperia.** Western or evening land; with Greek poets, Italy; with Romans, Spain.

**Hesperides.** Three, four, or seven maidens, daughters of Atlas and Hesperis; they lived on the River Oceanus (or near Mount Atlas), and, with help of the dragon Ladon, watched the golden apples which Gæa gave to Juno at her marriage.

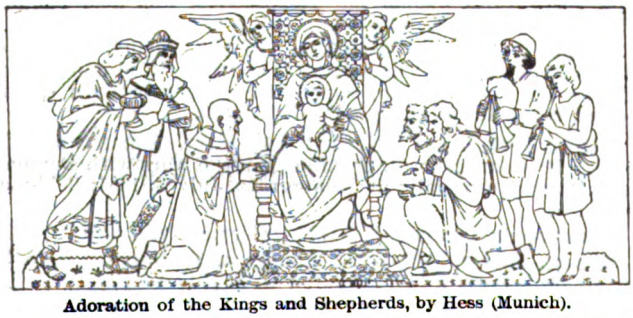
Restoration of Skeleton of *Hesperornis regalis*: *a*, tooth, with germ of 2d tooth (magnified).

**Hesperidium.** Fruit of the Orange family, consisting of a many-celled ovary covered with a rind. Morphologically it is regarded as a modification of the Berry.

**Hesperornis.** Fossil bird possessing teeth in both jaws; described by Marsh from the Cretaceous strata of the Western States. See ODONTOLCÆ.

**Hesperus.** Son of Astracus and Eos, the bringer of light; name applied to the planet Venus by the ancients when she set after the sun.

**Hess,** HEINRICH MARIA VON, 1798–1863. German historical



Adoration of the Kings and Shepherds, by Hess (Munich).

and fresco painter. Louis I. of Bavaria made him director of an institution for the advancement of glass-painting. Chief works in the Munich Gallery *Apollo and the Muses, Adoration of the Kings and Shepherds, Last Supper.*

**Hesse.** Territory of w. Germany, occupied by the Catti or Chatti 15. Moving westward with the Franks, they were succeeded by Saxons. Heinrich I., d. 1306, founded the present house of Hesse. The Reformation was introduced under Philip I., from two of whose sons are derived the two lines of Darmstadt and Cassel.

**Hesse,** LUDWIG OTTO, 1811–1874. German mathematician, prof. Koenigsberg 1845, Halle 1855, Heidelberg 1856, and Munich 1868. He contributed largely to Crelle's *Journal*. *Analytical Geometry of Space*, 1861. An important form in Determinants has its name, "Hessian," from him.

**Hesse-Cassel.** Elder line of House of Hesse, founded by Wilhelm IV., 1567–1592, whose grandson, Wilhelm V., fought on the Swedish side in the Thirty Years' War. Charles I. began 1672 the practice of hiring out Hessian soldiers to foreign princes. Friedrich I. became King of Sweden by marriage 1720, and resigned his Hessian possessions to his brother Wilhelm VIII., who fought under the English flag in the Seven Years' War. His son, Friedrich II., kept up a splendid court on pay obtained from England for the services of 22,000 Hessians against the American colonies. His son, Wilhelm IX. (I. as elector after 1803), fought, with his mercenaries, first on the side of the Empire, and then on that of France. Napoleon, at the Peace of Tilsit, 1806, incorporated the electorate in the kingdom of Westphalia. Wilhelm I. returned to his dominions 1813. No satisfactory constitution was granted till 1862. H.-C. was a German electorate, but having sided with Austria, it was annexed to Prussia 1866. Area 3,700 sq. m.; pop., 1864, 745,063. See HESSE-NASSAU.

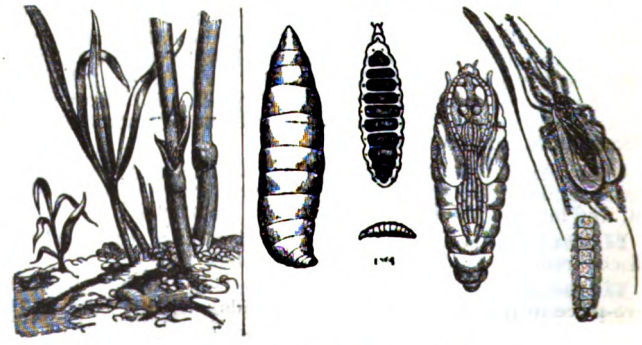
**Hesse-Darmstadt.** Second branch of House of Hesse; derived from Count George I., 1567–1596. H.-D. gained additions of territory under Napoleon. Ludwig X. acted as an ally of the French till after the battle of Leipzig, but joined the German Confederation 1814. H.-D. supported Austria 1866, for which she paid a heavy indemnity. She joined the N. German Confederation 1867. It is a grandduchy. Area 2,966 sq. m.; pop., 1890, 992,883.

**Hesse-Homberg.** Part of Hesse-Darmstadt till 1596, when it became an independent state. It joined the Zollverein 1835; reverted to Hesse-Darmstadt March 1866; was ceded to Prussia Sept. 1866, and now forms part of the provinces of Hesse-Nassau and Rhenish Prussia. Area 106 sq. m.; pop., 1864, 27,374.

**Hesse-Nassau.** Province of Prussia since 1866, including Hesse-Cassel, Hesse-Homburg, Nassau, and Frankfort-on-the-Main. It is between Saxony and Bavaria on the east and the Rhine on the west. Area, 6,055 sq. m.; pop., 1890, 1,664,426.

**Hessian.** Determinant whose elements are second differentials. It is a derived function for the Jacobean (J), and like it is a covariant. Its symbol is H(u), where (u) represents the form of the primitive function. As a locus it represents a covariant curve which is the locus of double points on the polar conics of the given curve.

**Hessian Fly.** *Cecidomyia destructor.* An eighth-inch long, of dusky color; one brood appears in May and June, a second in Sept. and Oct. Nearly 100 eggs are laid on top of a leaf of grain; they hatch in ab. a week into small, white



Hessian Fly (*Cecidomyia destructor*).

grubs that burrow in the stalk, absorbing its juices and causing it to break. It passes the winter as a pupa in the stalk of wheat. It has been injurious to wheat since 1778, and is supposed to have been imported in straw used by the Hessian troops.

**Hessian Purple.** Sodium salts of the compounds, produced by the action of the diazo compound of diamidostilbene sulphonic acid on the naphthylamines and naphthionic acid; dark powders soluble in water, which dye cotton a bluish red without mordant. Hessian violet is a similar compound, except that it dyes a violet shade.

**Hessian Violet.** See HESSIAN PURPLE.

**Hessian Yellow.** Sodium salt of the product of the action of the diazo compound of diamidostilbene sulphonic acid on salicylic acid; yellow powder, soluble in water. It dyes cotton yellow without a mordant.

**Hesychasts.** Greek mystics of Mt. Athos, opposed by Barlaam, and approved by a synod of Constantinople 1351.

**Hesychius.** 1. Alexandrian author of an important Greek lexicon, 390 or later. 2. Milesian author of a work on Greek writers, and of a history of the world to 518: portions of both remain.

**Hestia.** Greek goddess of the hearth-fire and of domestic life; sworn to perpetual virginity; protectress of suppliants at the domestic hearth, and also at that of the larger family, the city or state. See VESTA.

Hestia (Vesta). From an Ancient Statue.

**Hetæræ.** Ancient Greek concubines and courtesans of the better class.

**Hetæria.** Greek society ab. 1790–1828, at first literary, then revolutionary, aiming to throw off the Moslem yoke.

**Heterauxesis.** Unsymmetrical growth of organs.

**Heterio.** Gynœcium of flowers when composed of numerous distinct pistils forming achenes, drupelets, or other indehiscent fruits.

**Heterocarpous.** Plants bearing fruit of two or more kinds.

**Heterocercal.** Fish which, like the modern shark and sturgeon, have their tails unequally bilobate and the vertebral column running along the upper caudal lobe; the only form of fish tail found in the Paleozoic Strata.

**Heteroclinous.** Plants with both staminate and pistillate flowers.

**Heterocysts.** Certain specialized cells of unknown function borne by many of the *Cyanophyceæ*.

**Heterodont Dentition.** Teeth not alike.

**Heterodontidæ.** See CESTRAPHORI.

**Heterodromous.** Organs which coil or are spirally arranged first in one direction and then in the opposite.

**Heteræcious.** Fungi which affect different host plants in their successive life stages.

**Heterogamous.** Flowers of the Composite family when some are fertile and the others hermaphrodite or sterile.

**Heterogamy.** Form of alternation of generations, in which the different kinds of generations are all sexual, as in plant lice and *Distomum*. Usually some generations are parthenogenetic.

**Heterogeneous Expression.** One in which the terms are not of the same degree; opposed to homogeneous.

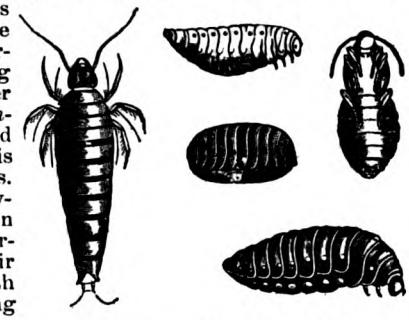
**Heterogenesis.** Production of offspring that are different from the parents: 1, that of living organisms from inorganic matrices or spontaneous generation, which is supposed to have taken place once (see ARCHIGONIA); 2, generation of new species from different species, which certainly does not occur and probably never has occurred except by the methods of evolution (see SALTATORY EVOLUTION): 3, phenomena of ALTERNATION OF GENERATIONS (q.v.). See BARNACLE GEESE.

**Heterogeny.** See ABIOGENESIS.

**Heterogonous.** Flowers whose stamens or pistils are of different structure or length, and adapted to cross-fertilization.

**Heteromastigoda.** Order of Lyssoflagellates, including various Flagellates that have a large trailing flagellum and a small forwardly directed tractellum; *e.g.*, *Heteromita*.

**Heteromera.** *Coleoptera* having the tarsi of the two anterior pairs of legs five-jointed, and of the posterior pair four-jointed. Here belong the Spanish Blister beetle, *Lytta* (or *Cantharis*) *vesicatoria*, and also *Sitaris*, which is parasitic in bee hives. The larvæ live in flowers, and thus get on bees. They are furnished with three pair of legs, and with mouth parts adapted to feeding on the larvæ of bees. Later they lose these organs, become grub-like, and live on honey. From this stage arises the pupa, and thence the adult beetle.



Heteromera (*Sitaris muralis*).

**Heteromerous.** Flowers the numbers of whose parts are different in the different cycles.

**Heteromorphæ.** Order of Birds, including large S. American forms with schizognathous palates, arched thick beak, bristled at the base, the eye margins and cheeks naked. *Opisthocomus* (*Hoazin*) is the one genus included.

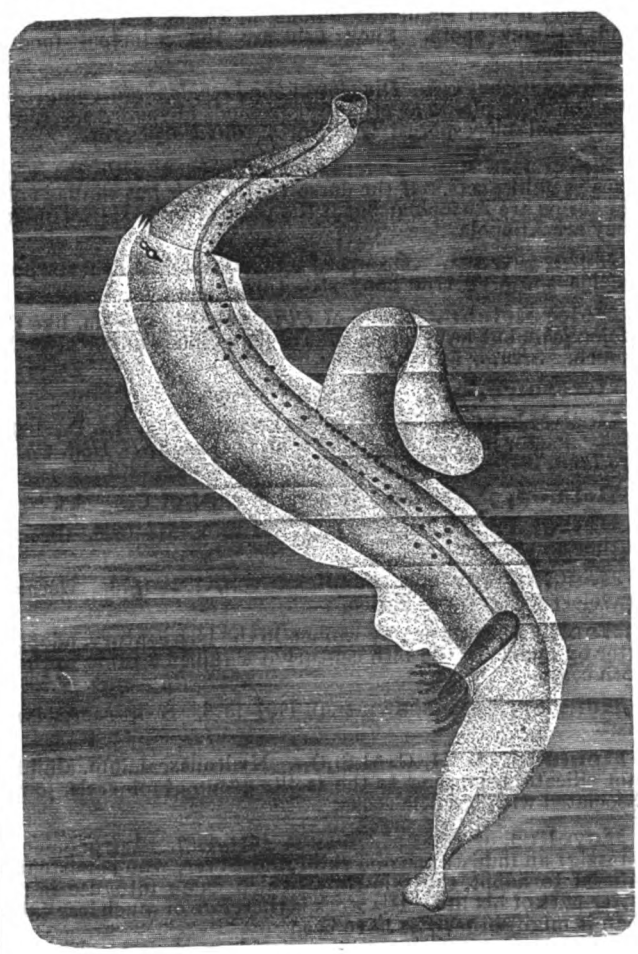
**Heteromyaria.** Division of asiphoniate Lamellibranchs, including forms with the anterior adductor muscle not so fully developed as the posterior one. Here are included *Pinna* and *Mytilus*. See MYTILIDÆ.

**Heteronomy.** Structures composed of different sorts of elements; or, if homologous, developed to diverse degrees of complexity.

**Heterophagi.** Birds whose young are altrices.

**Heterophyllous.** Plants bearing more than one kind of leaves.

**Heteropoda** (NATANTIA, NUCLEOBRANCHIATA, PTEROTRACHEIDÆ). Pelagic *Gastropoda*, with a long fin-like foot,



Pterotrachea.

differentiated into an anterior fin, often bearing a sucker, and a posterior fin, the metapodium. The head is well developed, and usually bears a proboscis and movable eyes. The shell is relatively small, cup-shaped, spiral, or rudimentary. The radula is armed with strong teeth. The animals are diœcious and carnivorous. There are three groups, the *Atlantacea*, *Carinariacea*, and *Pterotracheidæ*.

**Heteropola.** Organisms with a longitudinal axis with unlike poles, and also having cross axes; the latter are alike in homostaura, and unlike in heterostaura.

**Heterosomata.** Sub-order of Anacanthini, including the flat fishes, *Pleuronectidæ*. This family includes the Halibut, Turbot, Plaice, Flounder. The Halibut (*Hippoglossus*) lives in waters below 45° F., and at a depth of sometimes over 300 fathoms. It attacks the cod. The male rarely exceeds 50 lbs. in weight, the female exceeds 100 when full grown. The best flesh is from fat females between 20 and 80 lbs. The roe is large, sometimes containing 2,000,000 eggs. These are spawned in the autumn. The Turbot (*Psetta*) is found on all the coasts of Europe. The eggs are small; and over 14,000,000 were found in a 23-lb. fish. The Turbot has a wide body, no scales, and is spotted with blotches of dark color. The Plaice is a small flounder under 10 lbs.; 3,000,000 are annually consumed in London. The Sole is another European flounder; it is of small size, oblong in shape, grayish in color, and without spots. Shell fish are the principal food of Flounders.

Heterosomata.

**Heterosporeæ.** Division of the *Pteridophyta*, comprising such of those plants as produce two kinds of spores; *i.e.*, megaspores and microspores; Quillworts, *Rhizocarpeæ*, etc.

**Heterostaura.** Heteropolar organisms with the cross axes in unlike sets. If the dorso-ventral axis has similar poles the forms are Autopola; but if the poles of this axis are unlike, they are Allopola.

**Heterostraci.** Group of Cephalaspidian fishes whose shields show no true bony structure.

**Heterotricha.** Group of *Ciliata* that have cilia, like the *Holotricha*, but have also a zone of long cilia about or near the mouth. *Stentor* is an example.

**Heterotropous.** See AMPHITROPOUS.

**Hetherington,** WILLIAM MAXWELL, D.D., LL.D., 1803–1865. Pastor in Edinburgh and prof. in Glasgow. *Hist. Ch. of Scotland*, 1841–43; *Hist. Westminster Assembly*, 1843.

**Hetman,** or ATAMAN. General or chief of Cossacks.

**Hetzel,** PIERRE JULES ("P. A. STAHL"), 1814–1886. French author and publisher.

**Heuglin,** THEODOR. FREIHERR VON, 1824–1876. German traveler; writer on n. Africa.

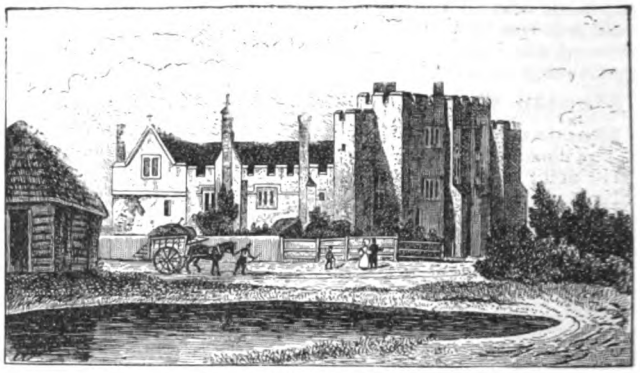
**Heuk.** Cloak worn by women in the 14th century, adopted later by men. In the 15th century it signified a tunic worn by both sexes.

**Heusser,** META (SCHWEIZER), 1797–1876. Swiss sacred lyric poet.

**Heulandite.** $H_{10}CaAl_2Si_6O_{21}$. Hydrous, calcium, aluminium silicate, belonging to the zeolite group of minerals, found associated with basaltic rocks.

**Hevelius,** or **Hovel,** JOHANN, 1611–1687. Astronomer of Dantzig; an industrious and skillful observer, who persistently refused to adopt the telescope, which came into use in the latter part of his life. His work is therefore of much less value than it might otherwise have been.

**Hever Castle.** Near Tunbridge, in Kent, England, the residence of the unfortunate Anne Boleyn, where Henry VIII. spent the happiest days of his courtship.


Hever Castle.

**Hewes,** JOSEPH, 1730–1779. Signer of the Declaration of Independence; M.C. from N. C. 1774–76 and 1779.

**Hewit** (NATHANIEL) AUGUSTUS FRANCIS, D.D., b. 1820. Superior of the Paulists; prof. in their sem., New York, 1865–89; prolific writer.—His father, NATHANIEL, 1788–1867, was pastor at Bridgeport, Conn., and active in the temperance movement.

**Hewitt,** ABRAM STEVENS, LL.D., b. 1822. M.C. 1875–86; Mayor of New York 1887–89.

**Hexacarpellary.** Ovary consisting of six carpels.

**Hexacoralla.** See MADREPORARIA.

**Hexactine.** Sponge spicule having three axes at right angles to each other, each of which grows at both ends. Various modified spicules that seem at first to belong to other systems have been derived from this sexaradiate type by excessive growth of one or more axes, or suppression of one or more rays. Thus we get the dagger, the five-rayed pentactine, the cross or staurus; also the clavula, uncinaria, scopularia, amphidisk, pinnulus, and anchor.

**Hexactinellidæ.** See HYALOSPONGIA.

**Hexactinia.** See ZOANTHARIA.

**Hexads.** Elements or radicals possessing a valence of six.

**Hexagon.** Polygon of six sides.

**Hexagynous.** Flower with six pistils.

**Hexahedron.** Solid bounded by six plane faces.

**Hexamerous.** Flowers constructed on the plan of six members of each circle of parts.

**Hexameter.** Heroic verse of Greeks and Romans, used in their epics. It consists of six dactyls or spondees.

**Hexandria.** Linnæan class of plants, comprising all those which have six equal stamens, as nearly all the Lily family, the Dock, and many Palms.

**Hexandrous.** Flower with six stamens.

**Hexane.** $C_6H_{14}$. Liquid hydrocarbon, known in various isomeric forms. Normal hexane boils at 69° C. It is obtained from crude petroleum, and is the most important constituent of low boiling gasolines.

**Hexapetalous.** Corolla consisting of six petals.

**Hexaphyllous.** Calyx or corolla composed of six leaves (sepals or petals).

**Hexapla.** Origen's edition of O. T., in the original Hebrew, with several Greek versions. Fragments of it remain.

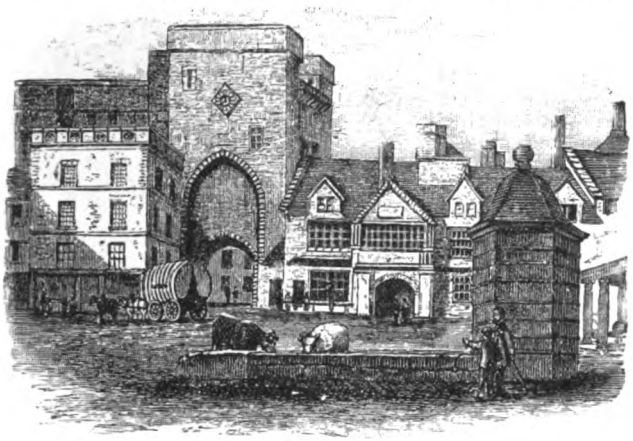
**Hexapoda** (INSECTA). Group of *Tracheata*, characterized by having the body differentiated into three regions; 1, the head, consisting of four united segments, bears a pair of compound eyes and a group of ocelli, also a pair of antennæ, and three pairs of mouth appendages, variously modified; 2, the thorax, consisting of three segments, each bearing a pair of legs, and the last two each a pair of wings usually; 3, the abdomen, of nine or ten segments, without legs, though the last segments may carry appendages that serve reproductive purposes. Like the other Arthropods, Insects renew their skins during growth, which is rapid during development. In most Insects the adult is very different from the young, and hence a change called metamorphosis is effected. According to the extent of this change, we have three main groups: AMETABOLA, HEMIMETABOLA, and HOLOMETABOLA (q.v.).

**Hexasepalous.** Calyx composed of six sepals.

**Hexastyle.** Portico with six columns supporting the roof.

**Hexateuch.** First six books of O. T.; term lately introduced by the higher biblical criticism to include the Pentateuch and Joshua, now supposed to have been compiled by several persons from different sources.

**Hexham.** Town of Northumberland, on the Tyne; scene of the defeat, May 8, 1464, of the Lancastrians under Somerset



Hexham.

by the Yorkists under Montague. Somerset was taken prisoner and beheaded. Pop., 1891, 5,945.

**Hexylene.** $C_6H_{12}$. Liquid hydrocarbon, which unites readily with bromine. Known in various forms, boiling from 60° to 70° C.

**Heyden,** JAN VAN DER, 1637–1712. Dutch painter of landscape and architecture.

**Heylin,** PETER, D.D., 1600–1662. Anglican divine and prolific writer. *Ecclesia restaurata*, 1661; *History of Presbyterians*, 1670.

**Heyne,** CHRISTIAN GOTTLOB, 1729–1812. Prof. Göttingen from 1763; editor of Homer, Virgil, and other classics. *Opuscula*, 6 vols., 1785–1812.

**Heyse,** PAUL JOHANN LUDWIG, b. 1830. German poet, dramatist, and novelist; son of Karl W., a noted philologist. Of his numerous works, eminent for thought and style alike, several have appeared in English versions, especially *Children of the World*, 1873, and *In Paradise*, 1875.

**Heyward,** THOMAS, 1746–1809. Signer of the Declaration of Independence; M.C. from S. C. 1775–78.

**Heywood,** JOHN, ab. 1500–1565. English author of interludes and epigrams. *Spider and Fly*, 1556.

**Heywood,** THOMAS, ab.1575–ab.1655. English dramatist. Besides 23 plays, repub. 1874, he wrote *England's Elizabeth*, 1631, and other prose works.

**Hezekiah.** Son of Ahaz; King of Judah ab. 728–699 B. C.; timid and over-politic, but pious and upright. His relations to Sennacherib form an interesting chapter of both Jewish and Assyrian documents.

**Hiawatha.** Legendary hero of the Iroquois, celebrated by Schoolcraft 1839–56, and by Longfellow 1842.

**Hibbert Lectures.** Founded in London 1878 for the free and scholarly handling of religious or theological topics. Max Müller and Rénan were among the first lecturers.

**Hibernacula.** Winter buds.

**Hibernation.** Winter sleep; condition obtaining with most cold-blooded animals in northern regions, and some mammals, as rodents and bears.

**Hibernia.** See IRELAND.

**Hichens,** ROBERT S., b. 1865. Musical critic of London *World;* author of *The Green Carnation*, 1894, *An Imaginative Man*, 1895, and other tales.

**Hickes,** GEORGE, D.D., 1642–1715. Nonjuring Bp. of Thetford 1694. *Anglo-Saxon Grammar*, 1689; *Thesaurus Linguarum Veterum Septentrionalium*, 1705.

**Hickok,** LAURENS PERSEUS, D.D., LL.D., 1798–1888. Prof. Auburn Theol. Sem. 1844; Vice-pres. Union Coll. 1852, Pres. 1866–68. *Psychology*, 1848–54; *Moral Science*, 1853; *Logic*, 1875.

**Hickory.** Trees of the genus *Hicoria*, of the Walnut family, bearing edible nuts and producing very strong timber, natives of e. N. America. The average tensile strength is ab. 11,000, and the average compressive strength ab. 8,000 lbs. per sq. inch.

Hickory Nut.

**Hickory,** OLD. Nickname of Andrew Jackson.

**Hicks,** ELIAS, 1748–1830. American Quaker preacher, whose liberal doctrines led to a split in the Society of Friends 1827. *Observations on Slavery*, 1811; *Doctrinal Epistle*, 1824; *Journal*, 1828. The new body, which never accepted the name "Hicksite," was disowned by London Yearly Meeting ab. 1827, and commonly regarded by the orthodox as Unitarians. Its membership is ab. 40,000.

**Hicks,** JOHN BRAXTON, M.D., b. 1823. London obstetrician.

**Hicks,** THOMAS, 1823–1890. American portrait painter.

**Hicks,** THOMAS HOLLIDAY, 1798–1865. Gov. of Md. 1858–62; U. S. Senator 1863.

**Hicks,** WILLIAM, 1831–1883. British officer commanding the Egyptian army; defeated by the Mahdi Nov. 3, 1883.

**Hicks-Beach,** SIR MICHAEL EDWARD, b. 1837. M.P. 1864; Sec. for Ireland 1874 and 1886; Colonial Sec. 1878–80; Pres. Board of Trade 1888–92.

**Hidalgo.** Spanish noble of lowest rank.

**Hidalgo de Cisneros y Latorre,** BALTAZAR, ab. 1755–1829. Spanish admiral; Viceroy of La Plata 1809–11; Minister of Marine 1818–20.

**Hidalgo y Costilla,** MIGUEL, 1753–1811. Mexican revolutionist; defeated by Spaniards on the Santiago R., Jan. 17, 1811; degraded from the priesthood and executed.

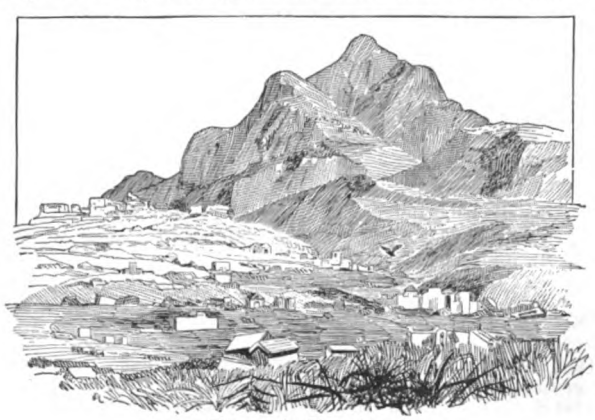
**Hiddenite.** $LiAlSi_2O_6$. Lithia emerald; lithium, aluminium silicate, allied to spodumene, but containing some chromium, to which it probably owes its yellowish green or emerald green color, and its value as a gem-stone. Found in Alexander co., N. C.

**Hide.** Old English measure of land variously estimated at from 60 to 100 acres.

**Hide and Seek.** Child's game in which one of the players called It is blindfolded while the others hide. The one who is It then endeavors to spy the others, crying out the name, and touching the goal. If the one espied can first touch the goal he is free. The one first caught usually becomes It in the next game; common boys' game in Eastern Asia, where it is played in the same manner as in Europe and America.

**Hiel,** EMANUEL, b. 1834. Belgian poet and dramatist. *Bloemardinne*, 1877; *Belgenland*, 1880; *Lucifer; Helga.*

**Hierapolis.** Ancient city (1) of Syria: (2) of Phrygia; birthplace of Epictetus, 5 m. n. of Laodicea. Celebrated for



Hierapolis, Phrygia.

remarkable mineral springs described by Strabo. Magnificent ruins still exist; now known as Pamluck-kale.

**Hierarchy.** Form of government supposed to have especial Divine sanction, involving the union of Church and State, the ruler being in some sense head of both, as with the Hebrews, the papacy, and generally in the Middle Ages; still extant in despotisms, as Turkey and Russia; sometimes especially the ecclesiastical system.

**Hieratic Writings.** See HIEROGLYPHICS.

**Hiero I.** Tyrant of Syracuse 478–467 B.C.; patron of literature. He gained a naval victory over the Etruscans 474.

Coins of Hiero I.

II. King of Syracuse 270–216 B.C., after his defeat of the Mamertines; friend of the Romans from 263. His coinage is still abundant.

**Hierocles.** 1. Reputed author of a Greek jest-book. 2. Neoplatonist of Alexandria, ab. 450–500, commentator on Pythagoras' Golden Verses, and writer on the e. provinces.

**Hieroglyphics.** Sacred carvings or writings. The Egyptian picture-writing was originally wholly pictorial. It then became partly ideographic, and finally partly alphabetic. In the earliest shape known to us (4000 B.C.) all these stages are combined, and they continued in combination till the final decay of the system, ab. 250. Thus the picture of a lion (Egyptian *lubo*) may mean an actual lion, or the idea of strength, or the sound of the letter l. Besides the monumental carved hieroglyphics, others of a more conventional character, called Hieratic, were used on papyrus. A still more highly developed cursive form is known as Demotic. It is now widely believed that our own alphabet is derived from the alphabetic hieroglyphics by way of the Phenician. Thus our letter H is a picture of a sieve, first made as a circle with one cross-bar. The circle was turned by Phenician writing into a square with a cross-bar, and the upper or lower lines of the square were finally eliminated, giving the early form of the Greek H. For the deciphering of the hieroglyphics see CHAMPOLLION, YOUNG, and ROSETTA STONE, also PAPYRUS. The term is now extended to other similar systems, of which the most important are those of Mexico and Central America. The Mayan writings have not yet been translated. Their simple elements are not numerous, but are combined to form composite characters, of which in the Dresden Codex there are ab. 700.

**Hieronymites.** Monastic orders in Spain and Italy, founded 1360 and later.

**Hieronymus.** 1. Disciple of Aristotle. 2. Greek officer, historian of Alexander's successors. 3. Tyrant of Syracuse, slain 214 B.C. 4. See JEROME.

**Hierophant.** Priest who presided over the Eleusinian mysteries.

**Hieropolis.** Ancient city of Phrygia.

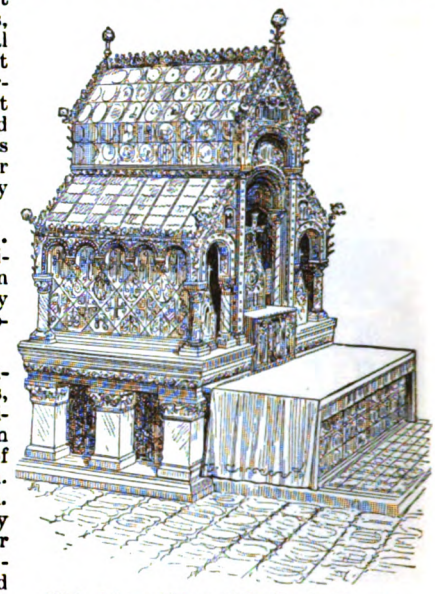
**Higden,** RALPH, ab. 1299–1363. Monk of Chester. *Polychronicon*, pub. 1482.

**Higgins,** ANTHONY, b. 1840. U. S. Senator from Del. 1889.

**Higgins,** MATTHEW JAMES ("JACOB OMNIUM"), 1810–1868. Irish essayist.

**Higginson,** THOMAS WENTWORTH, b. 1823. American author and reformer; pastor at Worcester, Mass., 1852–58; Col. 1st S. C. Vols. 1862–64. *Outdoor Papers*, 1863; *Malbone*, a novel, 1869; *Army Life in a Black Regiment*, 1870; *Atlantic Essays*, 1871; *Oldport Days*, 1873; *Hist. U. S.*, 1875.—His ancestor, FRANCIS, 1588–1630, pub. *New England's Plantations*, 1630.

**High Altar.** Chief altar in a church or cathedral consecrated for the Sacrament of the Holy Eucharist. It is usually at the e. end, except when, as at St. Peter's, Rome, it is a pontifical altar. Originally it consisted of a martyr's tomb, later it always contained saints' relics, was overlaid with silver and gold, and richly carved.



High Altar, Abbey of St. Denis, France.

**Highbinder.** Emissaries of the Chinese secret societies in Cal., who frequently commit crimes of violence.

**High Churchmen.** All Christians, but especially Anglicans, who maintain the illegitimacy of other forms of ch. polity than their own. The term is loosely used, and has never been officially assumed or recognized anywhere.

**High Commission.** English court, existing 1559–1641; mainly an instrument of royal tyranny: revived by James II. 1686–89. A similar court in Scotland dated 1608–38.

**Higher Algebra.** Branch of mathematics which classifies quantity as variable or constant, modifies the conditions of combination, and reaches highly generalized results. It embraces, in the broadest sense, the Calculus Differential and Integral, Determinants, Quaternions, and other specific discussions on abstract lines.

**Higher Criticism.** Study of the Scriptures or other writings, and inquiry into their sources and qualities, in a free, scientific spirit.

**Higher Law.** Expression first used by Senator Seward of N. Y. 1850 during the debate over the admission of California as a free or a slave State.

**Highest Good.** See SUMMUM BONUM.

**Highgate.** London n. suburb with associations of Whittington, Bacon and Coleridge. Pop., 1891, 4,500.

**Highlanders.** Inhabitants of the mountainous districts of n. and w. Scotland, long semi-barbarous, turbulent and predatory. Their attachment to the exiled Stuarts gave the government much trouble till in 1747 their heritable jurisdiction of feudal rights was abolished. The Highland regiments now are the 42d, 71st, 72d, 78th, 79th, 92d and 93d. See CLANS, TARTANS, GLENCOE.

Highlanders.

**High Low Jack.** See ALL FOURS.

**Highness.** Title and style of address given to Henry VII. of England, also by Louis XIII. of France to the Prince of Orange 1644, whose distinction previously had only been Excellency. It is now given to princes, granddukes, and all minor reigning potentates. See GRACE.

**High Mass.** With full ceremonial and music; sacramentally identical with a Low Mass.

**High Places.** Hills on which the Jews erected shrines for idol worship, often denounced in O. T., and destroyed by several pious kings.

**High-Pressure Engine.** See ENGINE.

**High Priest.** Chief of the Aaronic family of the tribe of Levi, in Israel, who alone could enter the Holy of Holies, and but once a year, on the Great Day of Atonement; in the Roman age capriciously exalted and deposed by the civil authority.

High Priest in his Robes and Breast-plate, and a Priest in Ordinary Dress of Temple Service.

**High Seas.** Uninclosed and public waters of the ocean or great lakes, outside the boundary and control of any country, and furnishing a free highway for commerce. They extend with the flow of the tide to high-water mark, as formerly only to low-water mark. In territorial jurisdiction, they lie outside a line three miles from the coast and parallel thereto.

**High Treason.** In Gt. Britain consisting of imagining or compassing the death of the king, queen, or eldest son; violating the king's wife, eldest daughter, or daughter-in-law; levying war against the sovereign; aiding the king's enemies; or slaying the chancellor, treasurer or judges. The punishment was forfeiture, corruption of blood, and hanging, drawing, and quartering. See TREASON.

**Highwater Shrub.** Coarse herbs of the genus *Iva*, and natural family *Compositæ*, inhabiting marshy places in the U. S. and tropical America. *I. frutescens* of the e. U. S. is known also as Marsh Elder.

**Highway.** Road for public use; it may be dedicated by the owner of the soil, or opened under legislative authority. The abutting owner generally holds title to the middle of the road, subject to the easement of the public to use the road for purposes of travel.

**Highway Bridges.** The trusses of highway bridges are proportioned to carry safely a live load of 60 lbs. per sq. foot of floor surface in country districts, 80 lbs. in towns, and 100 in cities where traffic is heavy. In addition, the floor stringers and beams are proportioned for the loads of heavy wagons and of electric cars. The weight of the heavier class of highway bridges may be approximately found from Merriman's formula:

$$W=(140+12b+0.2bl-0.4l)l,$$

in which l is the span in feet, b the width in feet, including sidewalks, and W the total weight in pounds. In the case of several spans, the most economic arrangement is usually that where the cost of the piers equals the cost of the superstructure. The types of trusses most frequently used are the Warren, the Pratt, and the bowstring. See BRIDGES and TRUSSES.

**Hilary.** Pope 461–468.

**Hilary,** OF ARLES, ST., ab.401–449. Bp. of Arles and Metropolitan of Gaul 429. He had difficulties with Leo I.

**Hilary,** OF POITIERS, ST., ab.300–368. Chief foe of Arianism in the West; Bp. of Poitiers ab. 350; banished to Phrygia 356.

**Hilary,** THE DEACON, 4th century. A Roman, supposed author of a commentary on St. Paul's epistles sometimes credited to Ambrose.

**Hilda,** ST., 614–680. English nun, abbess of Hartlepool 649, founder of the great monastery at Whitby 658.

**Hildebert,** 1057–1134. Bp. of Le Maus 1097, Abp. of Tours 1125; theologian and hymnist.

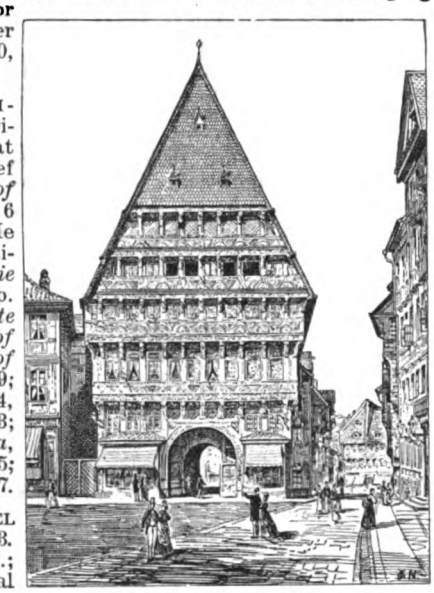
**Hildebrand.** See GREGORY VII.

**Hildebrand,** BRUNO, 1812–1878. German economist and statistician; ed. *Jahrbücher für Nationalökonomie und Statistik.*

**Hildebrand,** HANS OLOF, b. 1842. State antiquarian of Sweden 1879; author of sundry works on national history and art in the Middle Ages.

**Hildebrandsson,** HUGO, b. 1838. Director of the Meteorological Observatory at Upsala 1879; author of professional works in French and Swedish.

**Hildesheim.** Town of Hanover, founded 822; belonging to Prussia; noted for its buildings and other antiquities. Pop., 1890, 33,481.



Brewer's House, Hildesheim.

**Hildreth,** RICHARD, 1807–1865. American author; Consul at Trieste 1861. His chief work is a *History of the United States*, 6 vols., 1849–56. He wrote also an anti-slavery novel, *Archie Moore*, 1837, repub. 1852 as *The White Slave; History of Banks*, 1837; *Life of W. H. Harrison*, 1839; *Theory of Morals*, 1844, and *of Politics*, 1853; *Despotism in America*, 1854; *Japan*, 1855; *Atrocious Judges*, 1857.

**Hildreth,** SAMUEL PRESCOTT, 1783–1863. Prof. at Marietta, O.; pioneer in geological research of the country west of the Alleghanies. He made a special study of the coal-fields of Ohio and w. Pa., and in 1837 was Assistant State Geologist of Ohio.

**Hilgard,** EUGENE WALDEMAR, LL.D., b. 1833. Assistant Geologist of Mississippi 1855–57; State Geologist 1858; Prof. of Geology Univ. Mich. 1873, and of Agricultural Chemistry Univ. Cal. 1875.—His brother, JULIUS ERASMUS, 1825–1891, was connected with the U. S. Coast Survey 1845–85, and its head 1881–85.—Their father, THEODOR ERASMUS, 1790–1873, was a judge at Zweibrücken 1821–35, came to America with his sons 1835, and spent his later years in Germany.

**Hill,** AMBROSE POWELL, 1825–1865. Major-gen. C.S.A. 1862, Lieut.-gen. 1863; prominent in the Va. battles and at Gettysburg; killed near Petersburg, Va.

**Hill,** BENJAMIN HARVEY, 1823–1882. Member of the Confederate Senate 1861–65; M.C. from Ga. 1875–77; U. S. Senator 1877.

**Hill,** DANIEL HARVEY, 1821–1889. Prof. Washington Coll., Va., 1849–54, and Davidson Coll., N. C., 1854–59; Major-gen. C.S.A. 1862, Lieut.-gen. 1863; prominent in the Va. and Tenn. campaigns; pres. Univ. Ark. 1877, and Coll. Ga. 1887.

**Hill,** DAVID BENNETT, b. 1843. Lieut.-gov. of N. Y. 1883, Gov. 1885–91; U. S. Senator 1891.

**Hill,** DAVID JAYNE, LL.D., b. 1850. Pres. Bucknell Univ. Pa., 1879, and Univ. Rochester, N. Y., 1888. He has pub. *Rhetoric*, 1877–79; lives of Irving and Bryant, 1879–80; *Socialism*, 1885; *Psychology*, 1887; and *Genetic Philosophy*, 1893.

**Hill,** GEORGE WILLIAM, LL.D., b. 1838. American astronomer, in the *Nautical Almanac* office 1861–92; author of many memoirs; awarded the Royal Astronomical Society's gold medal 1887. *Jupiter and Saturn*, 1890.

**Hill,** ISAAC, 1788–1851. U. S. Senator 1831–36; Gov. of N. H. 1836–39.

**Hill,** JOHN, 1716–1775. English botanist. *History of Plants*, 1751; *Family Herbal*, 1755; *Sleep of Plants*, 1757; *Origin and Production of Proliferous Flowers*, 1759; *Hortus Kewensis*, 1768; *Vegetable System*, 1761–75.

**Hill,** JOHN HENRY, D.D., LL.D., 1791–1882. American missionary in Greece 1830; founder and head of a notable girls' school at Athens.

**Hill,** JOSHUA, b. 1812. M.C. from Ga. 1857–61; U. S. Senator 1869–73.

**Hill,** NATHANIEL PARKER, b. 1832. U. S. Senator from Col. 1879–85.

**Hill,** OCTAVIA, b. ab. 1838. English philanthropist. *Homes of the London Poor*, 1875.

**Hill,** ROWLAND, 1744–1833. English evangelist, noted for eloquence and eccentricity. *Village Dialogues*, 1801.—His nephew, ROWLAND, 1772–1842, served with distinction in Spain

and at Waterloo, became Baron 1814, Commander-in-chief 1828, and Viscount 1842.

**Hill,** SIR ROWLAND, 1795-1879. Author of the English penny postal system. The act embodying his proposal was passed 1839, and went into effect 1840. He was Secretary to the Post Office 1854-64; knighted 1860.

**Hill,** SAMUEL ALEXANDER, 1851-1891. Prof. Physics Muir Coll., Allahabad, Brit. India; author of memoirs on Indian meteorology and climate.

**Hill,** THOMAS, D.D., LL.D., 1818-1891. Pres. Antioch Coll. 1859, and of Harvard 1862-68. *Geometry*, 1855; *Sources of Theology*, 1875; *Arithmetic*, 1881; and two vols. of verse.

**Hillah.** Town in Asiatic Turkey on the right bank of the Euphrates, 63 m. s. of Bagdad, facing the ruins of Babylon. It

Hillah.

is fortified with earthen ramparts, a ditch, wall with four gates, and a citadel. It is a healthy town with manufactures of silk fabrics. Pop. 30,000.

**Hillebrand,** KARL, 1829-1884. Writer in several languages, b. in Germany; prof. Douai 1863-70; later in Italy. *Zeiten, Völker, und Menschen*, 7 vols., 1875-85; *German Thought*, 1880.

**Hillel,** d. 10. Jewish rabbi, head of an important school, opposed to that of Shammai; pres. Sanhedrim ab. 30 B.C.—His descendant, HILLEL, occupied similar positions in the 4th century.

**Hiller,** FERDINAND, 1811-1885. German pianist, composer, and litterateur. His writings have won greater popularity than his compositions, though the latter number over 200, among them six operas. Among his books is one on Beethoven and one on Mendelssohn. Oratorios: *Die Zerstörung Jerusalem*, 1840; *Saul*, 1858.

**Hillern,** WILHELMINE (BIRCH) VON, b. 1836, m. 1857. German novelist and dramatist. *Only a Girl*, tr. by Mrs. A. L. Wister 1870; *By His Own Might*, tr. 1872.

**Hillhouse,** JAMES ABRAHAM, 1789-1841. American poet. *Hadad*, 1825.—His cousin, JAMES, LL.D., 1754-1832, was U. S. Senator from Conn. 1796-1810.

**Hilliard,** HENRY WASHINGTON, 1808-1892. U. S. Minister to Belgium 1842-44, and to Brazil 1877-81; M.C. from Ala. 1845-51. *De Vane*, 1865.

**Hillsdale College.** Founded 1844 in Mich. by Free-Will Baptists. It has in all departments 25 teachers and over 500 students.

**Hilprecht,** HERMAN VOLLRAT, b. 1859 in Germany. Assyriologist; prof. Univ. Pa. 1887.

**Hilt.** Handle of a cutting or stabbing weapon. It is variously made of wood, iron, bronze, silver, gold, and ivory, sometimes inlaid with precious stones and exquisitely designed.

**Hiltl,** GEORG, 1826-1878. German novelist, historian, actor and manager at Berlin.

**Hilton Head.** Island of Beaufort co., S. C., taken by U. S. navy Nov. 7, 1861.

**Hilum.** Point of attachment of the ovules or seeds to their supports in the ovary or fruit.

**Himalaya.** Mountain system of s. Asia, the highest on the globe. Its general trend is w.n.w. and e.s.e., bearing around to e. and w. in its e. part. It rises abruptly from the low valley of the Ganges and the Punjab in n. India to a mean height of 16,000 to 18,000 ft., with peaks reaching to 25,000 to 29,000 ft., the highest summit being Mt. Everest, 29,002 ft. The system stands upon the s. border of the great plateau of Thibet, with a mean elevation of 15,000 ft. The central part consists of granite and other crystalline rocks, with Silurian beds on its flanks; in various places tertiary strata are seen. The snow line is at an altitude of 16,500 ft., being higher on the n. than on the s. side; the ranges contain glaciers on an immense scale.

Mt. Everest, Himalayas.

**Híméra.** River in s. Sicily. The Agrigentines were defeated here by the Syracusans 446 B.C., the Syracusans by the Carthaginians 311 B.C., and the Carthaginians by Marcellus 212 B.C.

**Hímera.** Greek city in n. Sicily, founded 649 B.C. The Carthaginians were defeated here by Gelon of Syracuse 480 B.C. It was carried by storm and razed to the ground by the Carthaginians 409 B.C.

**Himerius,** d. ab. 386. Greek orator, patronized by Julian.

**Himilco.** Carthaginian general, in Sicily 406 and 397 B.C.; defeated by Dionysius of Syracuse.

**Hinckley,** THOMAS HEWES, 1813-1896. American animal painter.

**Hincks,** EDWARD, D.D., 1792-1866. Irish Assyriologist.—His brother, SIR FRANCIS, 1807-1885, was premier of Upper Canada 1851-54; Gov. of Barbadoes 1855-62, and of British Guiana 1862-69; knighted 1869; Canadian Minister of Finance 1869-73.

**Hincmar,** 806-882. Abp. of Rheims 845; counselor of the Frankish kings; statesman and theologian.

**Hind,** JOHN RUSSELL, LL.D., 1823-1895. English astronomer, discoverer of many planetoids and asteroids; ed. *Nautical Almanac*, 1853-91. *Comets*, 1852-57; *Solar System*, 1853.

**Hind Brain.** Hindmost of the three cerebral vesicles of the embryo. It develops into the cerebellum and the medulla oblongata.

**Hindersin,** GUSTAV EDUARD VON, 1804-1872. Prussian artillerist, prominent in the wars with Denmark and France.

**Hind Gut.** Portion of intestine posterior to the umbilical stalk in embryos.

**Hinds,** SAMUEL, D.D., 1793-1872. Bp. of Norwich 1849-57. *History of Christianity*, 1828; *Sonnets*, 1834.

**Hindu Architecture.** The monuments erected by Mohammedans are by far the most massive, important, and costly buildings in India. Though often modified by a mixture of local elements, in the main they belong to the style imported by the invaders (see SARACENIC ARCHITECTURE). The indigenous styles of India are mainly two, the Buddhist and the Jain. The former does not antedate 300 B.C. Buddhist monuments are found in all parts of India, in Ceylon, and n. as far as the Punjaub. They are all, properly, religious monuments, but vary greatly in special purpose, and therefore in form. They include inscribed pillars, called lâts, topes, towers having interiors, rails or gateways, chaityas or temples and monasteries. One of the best known of the lâts is at Allahabad, a shaft shaped like a mast, bearing an inscription and also a necking composed of the honeysuckle ornament, originated in Assyria and frequently employed in Grecian architecture. This shaft is a monolith 33 ft. in length and tapering from 3 ft. to 2 ft. 2 in. in diameter. Other examples indicate that it was origi-

nally crowned with the grotesque figure of an animal. The topes were primarily shrines designed to contain relics of Buddha or other sacred objects. The largest and best preserved is the great tope at Sanchi, a domed circular building of masonry, 106 ft. in diameter and 42 ft. in height. The gateway is a rail resembling the gates of honor found in China and Japan, but in this instance having three crosspieces connected by the uprights. The antiquity of the topes is estimated to vary from 250 B.C. to 1200. The outsides are commonly plain, except for the gateways. The interiors are often elaborately decorated with carving, of which the artistic merit is slight. The gateways, or rails, are profusely but tastefully decorated. The chaityas, or temples, are, with one exception, excavated and not constructed. The best known of them, the cave temple at Ellera, is 85x43 ft. The entrance is in the form of a rude and massive linteled opening, supported by pillars. The monasteries are also rock-cut. There are, however, examples of constructed temples in the form of pyramids receding by terraces from a vertical base, and richly ornamented, though of small artistic value. The so-called Jain architecture is not older than the 10th century, while the Buddhist monuments had at that period almost ceased to be erected. In the kind of erections there is a strong similarity between the two styles. The later, however, is much more admired in respect of construction. The Jains used the arch form, though they did not build true arches with radiating joints, but merely projected from the sides of an opening overlapping layers of stone until they met at the top and closed the opening. The most peculiar of the Jain monuments is a tower, or sikra, of which the inclosing walls are curved outward. In addition there are remains of colonnades resembling Greek porticoes in arrangement, but without attached buildings. The proportions of these monuments are seldom just or felicitous, but the ornamentation, though barbaric, shows much inventiveness. Jain building in the n. of India continued until ab. 1750, or the eve of the British conquest; the most extensive and ambitious temples belong to this period. In some of them there is an evident infusion of the Saracenic style, while others are almost entirely free from Mohammedan influence.

**Hindu Art.** Never wholly original within our knowledge. At the earliest dates of surviving monuments, 3d century B.C., it had a Greek quality, due to the influence of the Alexandrian Oriental states. In its whole later career it is a bastard art, and, since the Mohammedan conquests, very largely of Arab origin. Within our knowledge the first impulse was given by Buddhism, and it has always been mainly religious in its uses.

Cootub Minar, Delhi, erected 1210-1231.

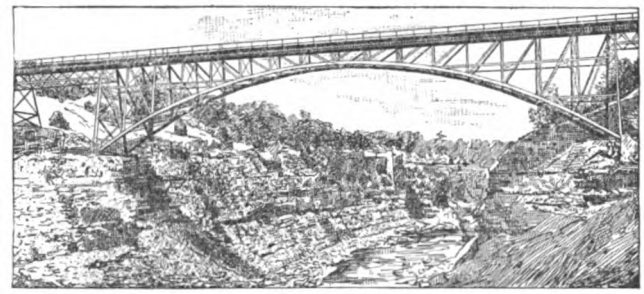
**Hinduism.** Pantheistic idolatry of India, developed through Brahmanism, out of the simple nature-worship of the Vedas; marked chiefly by rigid hereditary castes and the inviolable sanctity of the Brahmans.

**Hindu Kush.** Range of high mountains of w. Asia, connected on the e. with the Karakorum and Himalaya ranges and extending w. into n. Afghanistan. In altitude its peaks exceed 20,000 ft.

**Hindu Language.** See SANSKRIT.

**Hindustani Literature.** There is an imposing array of authors from 1200 to the present time. These are divided between the Hindi and Urdu dialects. The series of writers is subdivided into the early period extending to 1570, the middle, to 1750, and the third, during which the Urdu dialect was developed, closing with the modern, in which both forms have been employed. Many metrical ballads and heroic poems exist, constituting a vast literature, of which much is unpublished. The chief writers of the first period are Chand, Rāmānuja, Rāmānand, and Kabīr. In the second we find Kesav-Dās, Biharī Lāl, Tulsī-Dās. The later schools grew up about the native courts at Golconda, Bijapur, Delhi, and other places. Haidari, Husainī, Hafīzuddin Ahmad, Srī Lallū Lāl, and others, have written within this century.

**Hinged Arch.** Metal arch having hinges either at its crown or at the abutments. The Washington Bridge over the Harlem River at New York has arches of 508 ft. span, with hinges at the ends only. The arch over the Genesee River at



Bridge at Rochester, N. Y.

Rochester, N.Y., shown in the figure, is 428 ft. in span and has three hinges, one at each end and one at the crown. The use of hinges renders the arch free from stresses that might otherwise arise from changes in temperature. They are often used in metallic roof trusses.

**Hinge Ligament.** Structure in the outer part of the hinge of bivalve shells, which by its elastic contraction tends to open the valves.

**Hinnom.** See GEHENNA.

**Hinny.** Hybrid of horse and she-ass; smaller and weaker than the mule.

**Hinrichs,** GUSTAVE, b. 1850. German-American conductor and operatic composer.

**Hinrichs,** GUSTAVUS DETLEFF, M.D., b. 1836. Prof. of Chemistry in Iowa Univ. 1863–85; now resident in St. Louis; organizer and director of the first Iowa State Weather Service 1875; author of numerous special memoirs.

**Hinsdale,** BURKE AARON, b. 1837. Pres. Hiram Coll., O., 1870–82; prof. Univ. Mich. 1886; biographer of Pres. Garfield.

**Hinton,** JAMES, 1822-1875. English surgeon and philosopher. *Man and his Dwelling-place*, 1859; *Mystery of Pain*, 1865; *Philosophy and Religion*, 1881.

**Hiogo,** or HYOGO. Seaport of Japan, at the head of the Gulf of Osaka, on the s.w. coast of Niphon. It has a large commerce. Pop., 1892, 80,545.

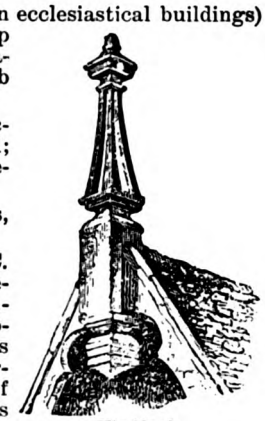
**Hiouen Thsang**, d. 663. Chinese collector of Buddhist books in India 629–644.

**Hip.** Fruit of the rose.

**Hip Disease.** Scrofulous and tubercular children are particularly liable to this disease. Great care should be exercised to prevent even slight injury to this joint in such children. See COXALGIA.

**Hipjoint.** Typical ball and socket joint formed by the head of the femur and a cup-shaped cavity (acetabulum) about the middle of the external surface of the innominate bone.

**Hip Knob.** Pinnacle, finial, or (in ecclesiastical buildings) cross, placed on the gable-point or hip of the roof. When the gable is ornamented with a barge-board the hip knob frequently terminates in a pendant.



Hip Knob.

**Hipp,** MATTHIEU, 1813–1893. Director of the Telegraph-Fabrik, Neuchatel; inventor of the Hipp system of meteorographs.

**Hipparchus.** Tyrant of Athens, slain 514 B.C. See HIPPIAS.

**Hipparchus,** 2d century B. C. Greatest of ancient astronomers. Before his time astronomy had been limited to knowledge of a number of isolated phenomena, some empirical rules for predicting eclipses and other occurrences, and many vague speculations of philosophers. Through him it was raised to the rank of a true science. Among his discoveries were the eccentricity of the orbits of the sun and moon, the precession of the equinoxes, the inequality in the length of the solar day. He determined with much accuracy the true length of the year, the obliquity of the ecliptic, and the amount of the precession; first used eclipses of the moon for determining longitude, and formed

the first catalogue of stars, the number being 1,080. A complete account of his work would embrace most of what was known of astronomy at that time.

**Hipparion.** Most characteristic representative of the Horse family in the Old World Miocene. It had three toes, was graceful, and of medium size. See EQUIDÆ.

**Hippeau,** CÉLESTIN, 1803–1883. French writer, chiefly on history and education. *Hist. Normandy*, 9 vols., 1863–73.

**Hipped Roof.** One having four slopes, thus forming two angles called hips on either side of the peak. A mansard roof is a special instance.

**Hippias,** d. 490 B.C. Son of Pisistratus; tyrant of Athens 527 B.C., with his brother Hipparchus; expelled 510 B.C. He persuaded the Persians to invade Greece.

**Hippo,** or HIPPO REGIUS. On Gulf of Bona, Africa; colony of Tyre; capital of Numidia; see-city of St. Augustine; taken by Vandals 431; destroyed by Arabs 646; rebuilt as Bona.

**Hippoboscidæ.** Family of (*Pupipara*) *Diptera* or Flies, known as Sheepticks. They are wingless, viviparous, and possess a uterus, which secretes a sort of milk for the nourishment of the embryo.

**Hippocampus.** Fabulous animal represented as drawing Poseidon's marine chariot; it resembles a horse with the hind quarters and tail of a dolphin. See LOPHOBRANCHII.

**Hippocras.** Medicated wine formerly much prized as a cordial, made of white wine sweetened and flavored with spices.

**Hippocrates,** OF CHIOS, 5th century B.C. Greek geometer, author of the first elementary treatise on Geometry, to which Euclid was largely indebted.

**Hippocrates,** ab.460–ab.357 B.C. Greek physician, "father of medicine." He revolted against the school which relied upon charms and magical means for effecting cures, and established more scientific methods. Much that is said of him is legendary.

Hippocrates.

**Hippocratic Oath.** Taken by ancient Greek physicians, binding them to honorable and legitimate practice.

**Hippocrene.** Fountain on Mt. Helicon, sacred to the Muses, said to have been produced by the feet of Pegasus.

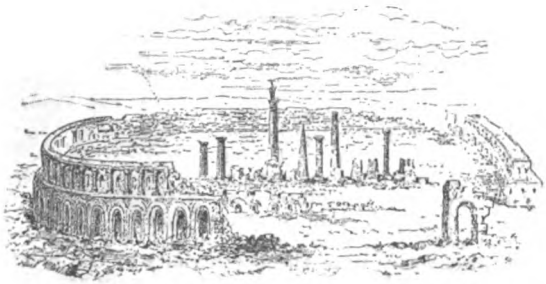
**Hippocrepian.** Horseshoe shaped, as the lophophore of certain *Polyzoa* (*Phylactolæmata*).

**Hippocrepian Bryozoa.** See LOPHOPODA.

**Hippodamia.** In Greek legend, daughter of Œnomaus of Elis, who made her the prize of chariot races, in which the vanquished was slain; wife of Pelops; mother of Atreus and Thyestes.

**Hippodont Dentition.** That in the lower molars of the horse, the tubercular ridges on the crowns of which are developed as longitudinally elongated crescents, each of the outer pair of ridges on each tooth being obliquely united to the corresponding member of the inner pair. They are amœbodont, the upper molars are antiodont.

**Hippodrome.** Place for ancient chariot races. The most famous ones were at Olympia and Constantinople. It



Hippodrome at Constantinople (from a Turkish drawing).

was one-half mile in length and one-eighth of a mile wide. The name is sometimes applied to the modern circus.

**Hippogriff.** Combination of Pegasus and griffin, in Mediæval legend and in Ariosto's *Orlando Furioso*.

**Hippolytus.** In Greek legend, son of Theseus and Antiope; slain on a false accusation of Phædra; celebrated by Euripides and Racine.

**Hippolytus,** ST., d. ab. 236. Bp. (supposed) of Portus, near Rome, and martyr; author of *Philosophumena*, against heresies.

**Hipponax,** 6th century B.C. Greek satiric poet, inventor of choliambic verse. Fragments survive.

**Hippophagy.** Eating of horse-flesh; anciently common among Scythians, Sarmatians, and other peoples; revived in Bavaria ab. 1845 and France 1865; now gradually coming into use. The prejudice against it appears unfounded.

**Hippopotamidæ,** or OBESA. Family of Bunodont, even-toed ungulates, including the genus *Hippopotamus*. *H. amphibius*, or River Horse, of African streams, is, excepting a rare w. African form, the only living representative; but a number of extinct species are found in other and now temperate regions. The animal attains a length of 12 to 17 feet and is

Hippopotamidæ (*Hippopotamus amphibius*).

very bulky, but swims and dives easily. The legs are short and have four nearly equal toes. The skin is two inches thick, and naked except at end of tail. The eyes and ears are very small. The lower canines and incisors are developed into strong tusks. The food is vegetable and is taken at night. Its stomach has four divisions.

**Hippuric Acid.** $(NH.CO.C_6H_5).CH_2.COOH$. Derivative of glycocoll, containing the benzoyl group; white crystalline acid, obtained from the urine of herbivorous animals. When boiled with hydrochloric acid it furnishes glycocoll and benzoic acid.

**Hippurites.** Genus of fossil bivalves, which are conical and attain a length of 18 in. They belong to the family *Hippuritidæ*. No recent shells belong to the same family.

**Hiram.** 1. King of Tyre, ab. 1000 B.C.; ally of David and Solomon. His cedar forests of Lebanon were serviceable in building the Temple. 2. Tyrian artificer, sent to Solomon to superintend his great works. Both in Chronicles are called Huram.

**Hiram College.** At Hiram, O.; organized 1867; maintained by Disciples or "Christians"; outgrowth of Western Reserve Institute, chartered 1850, of which J. A. Garfield was pres. 1857–61. It is coeducational, has (1895) 10 professors and 116 students in the college proper, and 395 in all.

**Hire,** LAURENT DE LA, 1606–1656. French painter.

**Hiring.** Bailment of a chattel: 1, to be used for a com-

pensation and returned by the hirer in as good condition as ordinary wear and tear will permit; 2, for the expenditure of labor thereon by the person hired, who must use ordinary skill and care, having reference always to the nature of the article and of the service.

**Hirn,** GUSTAVE ADOLPHE, 1815-1890. French writer on the steam engine.

**Hiroshima.** City on the inland sea of Japan; site of a naval college. Pop., 1891, 91,000.

**Hirpini.** Samnite tribe of s. Italy, subject to Rome from ab. 270 B.C. They rebelled 90 B.C., and were chastised by Sulla.

**Hirsch,** JOSEPH, b. 1836. Prof. Paris; writer on engineering.

**Hirsch,** MAURICE, BARON, 1831-1896. Jewish banker, giver of some $20,000,000 to educational and charitable enterprises.

**Hirschberg,** JULIUS, b. 1843. Prof. of Ophthalmology at Berlin from 1879; professional writer.

**Hirst,** HENRY BECK, 1813-1874. American poet. *Endymion*, 1848; *Penance of Roland*, 1849.

**Hirst,** THOMAS ARCHER, F.R.S., b. 1830. English writer on mathematics and physics.

**Hirtius,** AULUS, d. 43 B.C. Lieutentant of Cæsar; supposed author of B. viii. of De Bello Gallico; Consul 43 B.C.; killed at Mutina.

**Hirudinea** (DISCOPHORA, SUCTORIA; LEECHES). Hermaphrodite annelids, with flattened body, either not ringed or closely ringed (several segments corresponding to one internal metamere, as shown by the ganglionic chain, generative and segmental organs, etc.). Terminal suckers are present. There are three families, RHYNCOBDELLIDÆ, GNATHOBDELLIDÆ, and BRANCHIOBDELLIDÆ (q.v.).

**Hirudo Medicinalis.** See GNATHOBDELLIDÆ.

**Hirundo.** See FISSIROSTRES.

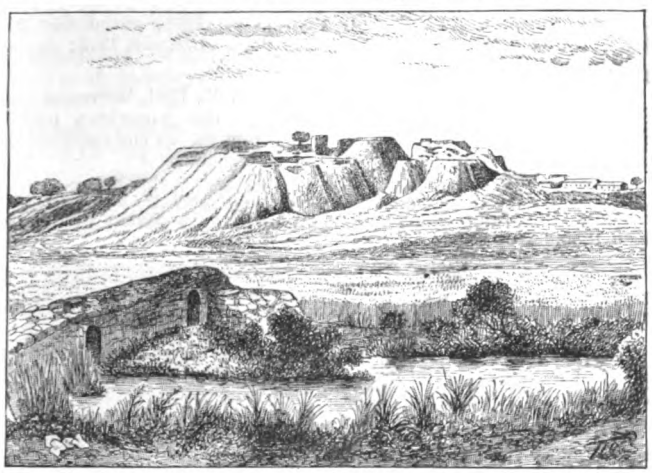
**His,** WILHELM, b. 1831. Prof. of Anatomy at Basel 1857 and Leipzig 1872; professional writer.

**Hisinger,** WILHELM, 1776-1852. Swedish mineralogist and chemist.

**Hispania.** See SPAIN.

**Hispaniola.** See DOMINICA and HAITI.

**Hissarlik.** In n.w. Asia Minor. Schliemann's explorations here revealed a series of towns lying one above another,



Hissarlik—Troy as it appears after the Excavations of 1879.

the third (later the second) of which in historical order he supposed that of the Homeric Troy.

**Histiæa.** Ancient city of n. Eubœa, long subject to Athens.

**Histiæus,** d. ab. 490 B.C. Tyrant of Miletus, who revolted against Persia.

**Histogenesis.** Development of tissues.

**Histogenetic Plasm.** That part of the protoplasm of generative cells which governs their activity while they are a part of the body of the parent; supposed by Weismann to be extruded in the polar globules so as to leave pure germinal plasm in the egg when it is to develop into an independent being.

**Histology.** Study of the tissues of plants or animals.

**Histolysis.** Breaking up of the tissues of larval insects in the pupa stage, so that the new structures of the imago may form.

**History.** Once mere narration, history has come more and more to require the investigation of the causes, effects, and relations of actions and events. In Egypt the invention of papyrus gave an added impulse to the tendency manifested before in oral tradition and graven inscription. But it was in Greece that the first great known narrator arose in the person of Herodotus. Thucydides went further, and to this day is a model in the philosophic discussion of history. Of the Romans Livy combined the two styles, and Tacitus added a deep moral purpose. During the Middle Ages the study of history died out and only revived with the invention of printing; since then, and especially since the 18th century, many brilliant names have appeared on the roll of historians, among whom we may mention Hume, Gibbon, Freeman, Froude, Macaulay, Carlyle, Motley, Bancroft, Prescott.

**History,** MILITARY. Narrative of campaigns written to illustrate the principles of grand tactics, strategy, and the art of war. The campaigns of Alexander, Hannibal, Cæsar, Frederick, Marlborough, Eugene, Napoleon, Wellington and other great leaders of armies furnish to the military student the lessons which military history has for its object to inculcate.

**Hitch.** In Mining, a place cut in the rock to receive and support the ends of timbers.

**Histricomorpha.** See HYSTRICOMORPHA.

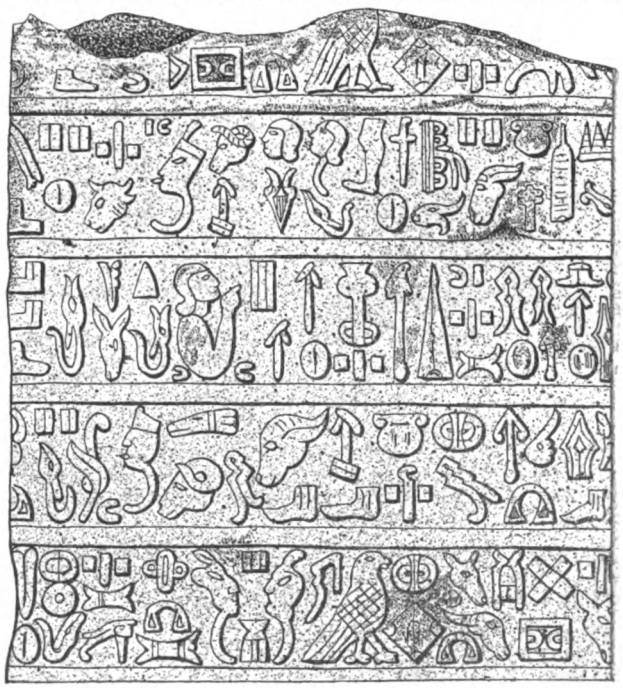
**Hitchcock,** EDWARD, D.D., LL.D., 1793-1864. Prof. Amherst from 1825, pres. 1845-54; State Geologist of Mass. 1830-44, and of Vt. 1857-61. He examined the fossil footprints of the Conn. Valley, and formed a valuable collection, preserved at Amherst. *Geology of the Conn. Valley*, 1823; *Catalogue of Plants*, 1829; *Report*, 1835-41; *Religion of Geology*, 1851; *Ichnology of New England*, 1858-65.—His son, EDWARD, M.D., b. 1828, became Prof. of Hygiene at Amherst 1861. *Anatomy and Physiology*, 1852.—His brother, CHARLES HENRY, b. 1836, Prof. of Geology at Dartmouth from 1869, was State Geologist of Me. 1861-62 and N. H. 1868-72. *Report*, 4 vols., 1874-78; *Geological Map, U. S.*, 1881.

**Hitchcock,** ETHAN ALLEN, U.S.A., 1798-1870. Major-gen. U. S. Vols. 1861; writer on the doctrines of Swedenborg and the hermetic philosophy, which he applied to the Gospels, Shakespeare's *Sonnets*, and Dante's *Vita Nuova*.

**Hitchcock,** ROSWELL DWIGHT. D.D., LL.D., 1817-1887. Prof. Union Theol. Sem., N. Y., 1855, Pres. 1880. He wrote a life of his predecessor, Dr. E. Robinson, 1863; *Analysis of the Bible*, 1869; *Socialism*, 1878; *Eternal Atonement*, 1888, and ed. 3 hymn books, 1874-85.

**Hitopadesa.** Collection of Sanskrit tales, tr. 1864; abridged from the *Panchatantra*.

**Hittites.** Ancient people, whose capital, Carchemish, was



Hittite Inscriptions at Carchemish.

on the Upper Euphrates, and who warred with Egypt and Assyria, and left many inscriptions, recently discovered. A

southern fragment of this race was conquered or absorbed by the Israelites.

**Hittorff,** JACQUES IGNACE, 1793–1867. German-French architect and writer on architecture.

**Hitzig,** FERDINAND, 1807–1875. Prof. at Zurich 1833, and Heidelberg 1861. He wrote a commentary on Isaiah 1833, and an incomplete *History of Israel*, 1869.

**Hiuen-Tsang.** See HIOUEN THSANG.

**Hives.** 1. Nettle-rash; eruption of wheals or bumps upon the skin, with more or less itching; generally due to errors in diet. Shellfish, peaches, and strawberries often cause it. 2. Chicken-pox.

**Hivites.** Tribe of Canaanites partly conquered by Israel.

**Hiwassee College.** Founded 1849 in Monroe co., Tenn.

**Hoadley,** BENJAMIN, D.D., 1676–1761. Bp. of Bangor 1715, Hereford 1721, Salisbury 1723, Winchester 1734. His sermon before the King 1717 denied temporal powers to the clergy and urged toleration of differing opinions: this opened the Bangorian Controversy, which caused the suppression of Convocation. His works were collected in 3 vols. 1773.—His sons, BENJAMIN, M.D., 1706–1757, and JOHN, 1711–1776, wrote several plays.

**Hoang Ho.** River of China. It heads in the Nin Shan Mts., n. of Thibet, and after an exceedingly crooked easterly course of 2,600 m. flows into the Yellow Sea. Drainage area 500,000 sq. m.

**Hoar,** EBENEZER ROCKWOOD, LL.D., 1816–1895. Judge Mass. Common Pleas 1849–55, and Supreme Court 1859–60; U. S. Atty.-gen. 1869–70; M.C. 1873–75.—His brother, GEORGE FRISBIE, LL.D., b. 1826, was M.C. from Mass. 1869–77, and has been U. S. Senator since 1877.

**Hoard Fence.** Temporary fence of boards placed around a work under construction to exclude visitors.

**Hoare,** SIR RICHARD COLT, 1758–1838. English antiquarian. *Hist. Wiltshire*, 1812–44.

**Hoarfrost.** Formation of a deposit of crystals of ice on cooled surfaces near the ground during clear nights. The vapor is apparently deposited on a very cold surface, and therefore frozen and crystalliform when deposited. The quantity depends principally on the gentle currents of air prevailing near the ground, and is therefore much smaller than in the case of Rimefrost. It is opaque and snowy.

**Hoary Pea.** See CATGUT.

**Hoazin,** or HOACTZIN. Unique bird of those parts of Guiana tributary to the Amazon. It resembles a curassow, goes in flocks, has many peculiar osteological features, and is hatched with forelimbs with digits that gradually are reduced and the forelimbs become gradually transformed into wings. Thus this bird appears to pass through a quadruped stage in its development.

Hoazin.

**Hobart.** Capital of Tasmania; on the Derwent; founded 1804; called Hobart Town till 1881. Pop., 1891, 24,905.

**Hobart** (PASHA), AUGUSTUS CHARLES, 1822–1886. British naval officer; blockade-runner 1861–64; in the Turkish service from 1867; Admiral 1868; commanding in the Black Sea 1878; Marshal 1881. *Sketches*, 1887.

**Hobart,** JOHN HENRY, D.D., 1775–1830. P. E. Bp. of N.Y. 1816. *Works*, 3 vols., 1833.—His son and namesake, 1817–1889, pub. *Mediæval, Papal, and Ritual Principles*, 1877.

**Hobart College.** At Geneva, N. Y.; chartered 1825 as Geneva College; controlled by P. E. Ch.; name changed 1852 and 1860. It has (1896) 17 instructors and 80 students. The De Lancey Divinity School was founded 1865.

**Hobbema,** MEINDERT, 1638–1709. Dutch landscape painter, more phlegmatic in temperament than Ruysdael and more literal in his rendering of nature, but ranking with him in general estimation.

The Avenue, Middelharnis, The Hague, by Hobbema (National Gallery).

**Hobbes,** JOHN OLIVER. See CRAIGIE, MRS.

**Hobbes,** THOMAS, 1588–1679. English philosopher, author of a theory of political absolutism, which made the state supreme authority in matters of morality and religion, and assumed that man's natural state was one of war, a conception that anticipates the evolutionistic doctrine of the struggle for existence and the survival of the strongest. His chief works are *Human Nature*, 1650; *De Cive*, 1642–51; *Leviathan*, 1651.

**Hobble Bush.** *Viburnum abnifolium.* Large-leaved shrub of the Honeysuckle family, native of e. N. America; also called American Wayfaring Tree.

**Hobby Horse.** Child's toy of high antiquity. It occurs among the Plains Indians of America as a ceremonial object used in dramatic dances. In China, Korea, and Japan, it is a favorite toy of boys, called Bamboo Horse.

**Hobhouse,** JOHN CAM, 1786–1869. M.P. 1820; Sec. of War 1831, Sec. for Ireland 1833, Pres. Board of Control 1835–41 and 1846–52; Baronet 1831, Baron Broughton 1851; noted for his intimacy with Byron. *Journey Through Albania*, 1813; *Italy*, 1859.

**Hobkirk's Hill,** BATTLE OF. April 25, 1781, between the British forces under Gen. Rawdon and the American under Gen. Greene, as the latter was pushing on to the capture of Camden, S. C.; a temporary defeat to Greene.

**Hoboken.** City of Hudson co., N. J., on w. bank of the Hudson River, opposite the lower end of New York; incorporated 1855. Pop., 1890, 43,648.

**Hobson's Choice.** Expression dating from ab. 1650, and based on the custom of the keeper of a livery-stable at Cambridge, who would hire out only the horse next the door.

**Hoche,** LAZARE, 1768–1797. French general, prominent in the first wars of the Republic. He attempted to invade Ireland 1796, and defeated the Austrians 1793 and 1797.

**Hochelaga.** Indian village on the site of Montreal; also a portion of the St. Lawrence.

**Hochheim.** Town in Hesse-Nassau, Prussia, famous for its wine, which gave its name Hock to all other white Rhenish vintages. Pop., 1891, 2,804.

**Hochkirch.** Village of Saxony, scene of the defeat of the Prussians under Frederick II. by the Austrians under Daun, Oct. 14, 1758.

**Höchst.** Town of Hesse-Nassau, 6 miles w. of Frankfort. Here Tilly defeated Duke Christian of Brunswick June 20, 1622, and the Austrians defeated the French Oct. 11, 1795. Pop., 1890, 8,455.

**Hochstädt.** Village of Bavaria, scene of three battles. 1. Sept. 20, 1703, defeat of Imperialists by Bavarians and French. 2. Aug. 13, 1704, the battle of BLENHEIM (q.v.). 3. June 19, 1800, defeat of Austrians by the French under Moreau.

**Hockey.** Game also called *Hawkey, Hookey, Bandy, Shinney, Shinny,* and *Shinty.* It is played both on the ice and on

the ground, by teams of varying size, though the commonly printed laws provide for fifteen on a side and a field of 125 yards long by 54 wide. The object of the play is to drive a small rubber ball between the opponent's goal-posts and under the goal-bar by means of repeated blows with a stick curved at one end to make it more effective. The Romans had a game called Pagnica, which was somewhat analogous to this. In the time of Edward III. a game called Cambucca was undoubtedly hockey. The bat was called a bandy, owing to the bent end. A 14th century manuscript in the British Museum contains a drawing of two bandy players.

**Hocktide,** or HOKETIDE. Anniversary of a defeat of the Danes 1002, observed in England till 1700 or later on the 15th and 16th days after Easter.

**Hodell,** FRANZ OSCAR LEONARD, 1840–1890. Swedish playwright and lyric poet.

**Hodge,** CHARLES, D.D., LL.D., 1797–1878. Prof. Princeton Theol. Sem. from 1822. He pub. commentaries on Romans 1835, Eph. 1856, I. and II. Cor. 1857–60; *Constitutional Hist. Presb. Ch. in U. S.*, 1840; *Way of Life*, 1841; *Darwinism*, 1874; and *Systematic Theology*, 3 v., 1871–72. His *Life* was pub. 1880 by his son ARCHIBALD ALEXANDER, D.D., LL.D., 1823–1886, prof. Allegheny, Pa., 1864, and in Princeton Theol. Sem. 1877. *Outlines of Theology*, 1860–78; *Presb. Forms*, 1868–82.

**Hodge,** FREDERICK WEBB, b. 1864 in England. Ethnologist of the Smithsonian Institution since 1889; writer on the pueblos and their occupants.

**Hodge,** HUGH LENOX, M.D., LL.D., 1796–1873. Brother of Charles; prof. Univ. Pa. 1835–63. *Obstetrics*, 1864.—His son and namesake, 1836–1881, pub. sundry surgical memoirs.

**Hodges,** EDWARD, Mus.Doc., 1796–1867. English organist, in New York 1838–63; composer of ch. music.

**Hodgkins,** THOMAS G., 1804–1892. Patron of Meteorology. Founder of the Hodgkins Fund for the investigation of the properties of atmospheric air in its relation to life. The Smithsonian Institution is the administrator of this fund of $200,000.

**Hodgkinson,** EATON, 1789–1861. English civil engineer, prof. Univ. Coll., London, 1847.

**Hodograph.** Locus of the free end of a right line which with one end fixed so moves as to represent at any instant in magnitude and direction the velocity of a point tracing out any path in any manner whatever; invention of Sir W. R. Hamilton, to whom also we owe many applications of it.

**Hodson,** WILLIAM STEPHEN RAIKES, 1821–1858. English major of cavalry, prominent in the Sepoy war; killed at Lucknow.

**Hoe,** RICHARD MARCH, 1812–1886. American inventor of the rotary or "lightning press" 1846.

**Hoeck,** JEAN VAN, 1598–1651. Flemish painter of religious and mythological subjects, pupil and imitator of Rubens. He was painter in ordinary to the Archduke Leopold and was

Philemon and Baucis entertaining Jupiter and Mercury, by Hoeck.

patronized by the most influential persons of his day. His best pictures are in Vienna, Rotterdam, Antwerp, Bruges, Louvain, and Stockholm.

**Hoefer,** JOHANN CHRISTIAN FERDINAND, 1811–1878. German-French writer on chemistry, botany, and horticulture.

**Hoeven,** CORNELIS PRUYS VAN DER, 1792–1871. Prof. Leyden from 1824; medical writer.—His brother, JAN, prof. Leyden 1835, pub. a *Handbook of Zoölogy*, 1827–46, tr. 1856–58.

**Hoey,** MRS. FRANCES SARAH (JOHNSTON), b. 1830, m. 1858 Irish novelist and translator. *A Golden Sorrow*, 1872; *Blossoming of an Aloe*, 1874.

**Hofdijk,** WILLEM JACOBSZOON, 1816–1888. Dutch poet, dramatist, and historical writer.

**Hofer,** ANDREAS, 1767–1810. Tyrolese patriot, who prevailed over the French 1809, was betrayed into their hands and executed.

**Höfer,** EDMUND, 1819–1882. German novelist and poet.

**Höffding,** HARALD, b. 1843. Prof. Copenhagen from 1883. *Psychology*, 1882, tr. 1891; *Ethics*, 1891.

**Hoffman,** CHARLES FENNO, 1806–1884. American novelist and poet. *Greyslaer*, 1840.

**Hoffman,** DAVID, LL.D., 1784–1854. Prof. Univ. Md. 1817–36; writer on law and history. *Chronicles from Cartaphilus*, 1853.

**Hoffman,** JOHN THOMPSON, 1828–1888. Recorder of New York 1861–64; Mayor 1866–69; Gov. of N. Y. 1869–72.

**Hoffman,** MURRAY, LL.D., 1791–1878. Asst. Vice-Chancellor of N. Y. 1839–43; Judge N. Y. City Superior Ct. 1853–61. *Chancery Practice*, 1834–43; *Ritual Law*, 1872; *Referees*, 1875.—His brother, OGDEN, 1793–1856, was M.C. 1837–41, U. S. District Atty. for N. Y. 1841–45, and Atty.-gen. of N. Y. 1853–55.

**Hoffman,** RICHARD, b. 1831 in Manchester. Pianist, teacher and composer in the salon style, well known in the U. S. since 1847.

**Hoffman,** WALTER JAMES, M.D., b. 1846. Naturalist to the *Wheeler* expedition 1871; asst. in Bureau of Ethnology since 1879.

**Hoffmann,** ERNST THEODOR AMADEUS, 1776–1822. German author, best known by weird and fantastic tales resembling those of Poe. *Works*, 15 vols., 1879–83.

**Hoffmann,** FRIEDRICH, 1660–1742. Prof. of Medicine at Halle from 1693; inventor of an anodyne. *Opera*, 9 vols., 1740–60.

**Hoffmann,** GEORG FRANZ, 1761–1826. Prof. of Botany in Göttingen. *De vario Lichenum usu*, 1786; *Plantæ Lichenosæ*, 1789–1801; *Deutschland's Flora*, 1791.

**Hoffmann,** HANS FRIEDRICH KARL, b. 1848. German novelist and poet.

**Hoffmann,** HEINRICH, 1809–1894. German humorist. His *Struwwelpeter*, 1845, sold over 150 editions.

**Hoffmann von Fallersleben,** AUGUST HEINRICH, 1798–1874. German lyric poet and philologist, prof. at Breslau 1830–42. *Horæ Belgicæ*, 1830–37; *Hist. German Ch. Song*, 1832.

**Hoffmeyer,** NIELS HENRIK CORDULUS, 1836–1884. Director of the Meteorological Institute in Copenhagen; author of a series of daily charts of the weather over the n. Atlantic and Europe.

**Hofler,** KARL ADOLF KONSTANTIN RITTER VON, b. 1811. Prof. at Munich 1840–47, and at Prague 1851. *German Popes*, 1839; *Slavic History*, 5 vols., 1879–83.

**Hofmann,** AUGUST WILHELM, 1818–1892. German chemist, Liebig's assistant at Giessen, then privatdocent at Bonn; prof. London 1845–55; Assayer of the Mint 1855–65; prof. Berlin from 1865. His most brilliant work was on the aniline dyes.

**Hofmann,** HEINRICH KARL JOHANN, b. 1842. German composer. *Frithjof Symphony*, 1874; Cantata, *Die schöne Melusine*, 1875; operas, *Armin*, 1876, *Aennchen von Tharau*, 1878, *Wilhelm von Oranien*, and *Donna Diana*, 1886.

**Hofmann,** JOSEF, b. 1877. Polish musician, who attracted much attention as a pianist when as a lad of ten he visited the United States in November 1887. Before the end of the season his parents were persuaded to take him off the concert stage and he became a pupil of Rubinstein.

**Hofmann's Violet.** $C_{26}H_{32}N_3Cl$. Triethylrosaniline hydrochloride, or the corresponding methyl compound; prepared by the action of ethyl bromide or chloride on fuchsine; green crystals, soluble in water; formerly used as a violet dyestuff.

**Hog.** See SWINE.

**Hogarth,** GEORGE, 1783–1870. English writer on music. *Hist. Opera*, 1838.

**Hogarth,** WILLIAM, 1697–1764. English painter, engraver,

and caricaturist of highest rank. His *Rake's Progress, Marriage à la Mode,* and other series are well known through engravings.

Taste in High Life, by Hogarth.

**Hog-Back.** 1. Low ridge caused by the outcropping of strata that stand at a high angle. 2. Uplifted portion of rock in the form of a sharp anticlinal arch, usually of limited extent.

**Hog Cholera.** Term applied indifferently to anthrax, contagious pneumo-enteritis, and a contagious catarrhal inflammation of the mucous membranes of the air-passages, stomach and intestines of swine.

**Hogshead.** Cask containing 63 old gallons (52½ Imperial gallons) of wine, or 54 old gallons (45 Imperial) of beer.

**Hogg,** JAMES, "THE ETTRICK SHEPHERD," 1772–1835. Scottish poet and writer of tales. *Queen's Wake,* 1813.

**Hogue.** See LA HOGUE.

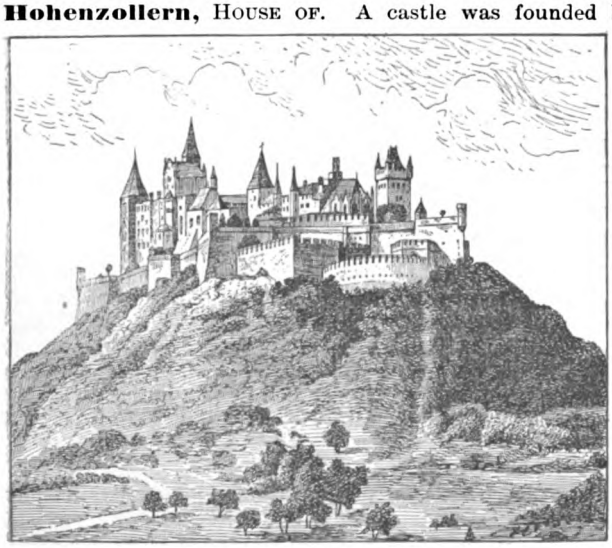
**Hogweed.** *Ambrosia artemisiæfolia.* N. American weed of the Composite family, known also as Hay-fever Weed, Bitterweed, Roman Wormwood, and Ragweed.

**Hohenlinden.** Hamlet of Bavaria, 20 m. e. of Munich. Here 60,000 Austrians were defeated by 70,000 French and Bavarians under Moreau, Dec. 3, 1800, with loss of 7,000 killed and wounded, 8,000 prisoners and 100 cannon. The peace of Luneville succeeded, Feb. 9, 1801. The battle is celebrated in Campbell's familiar verses.

**Hohenlohe,** CHLODWIG KARL VICTOR, PRINCE, b. 1819. German ambassador in Paris 1874; Gov. of Alsace 1883. His family is ancient, wealthy, and has produced many eminent men.

**Hohenstaufen,** HOUSE OF. Founded ab. 1050 by Fred. von Büren; named from a castle on the Danube. It furnished six successive emperors, who reigned 1138–1254.

**Hohenzollern,** HOUSE OF. A castle was founded by



The Castle of Hohenzollern.

Count Thessilo on the heights of Zollern, near Hechingen, ab. 800. His house divided into the Swabian and Franconian lines 1165. The former divided 1576. The reigning dynasty of Prussia is descended from Frederic VI., founder of the younger branch, H. Sigmaringen.

**Hôjô.** 1. Family that held the administration of military affairs in Japan 1225–1333. 2. Family holding power from ab. 1490; overthrown 1590 by Taiko-Sama.

**Hokusai,** KATSUSHIKA, 1760–1849. Japanese artist.

**Holbach,** PAUL HEINRICH DIETRICH, BARON D', 1723–1789. German philosopher settled in Paris, one of the Encyclopedists. His books were pub. in Amsterdam or London, and the authorship was long concealed. *Christianity Unveiled; Spirit of the Clergy; The Sacerdotal Imposture;* all 1767. *System of Nature,* 1770, tr. 1884; *Natural Ideas,* 1772; *Social System,* 1773.

**Holbein,** HANS, THE YOUNGER, ab. 1495–1543. German painter, b. at Augsburg, active at Basle and in England, where he was court painter to Henry VIII. His greatest picture is

The Ambassadors, by Holbein (National Gallery).

the Meyer Madonna in Dresden; a duplicate in Darmstadt is sometimes considered the original. Other fine works are at Basle. He ranks in greatness with Albert Dürer, these two painters being the leaders of their time in Germany.

**Holberg,** LUDVIG, 1684–1754. Danish dramatist, novelist, and historian, b. in Norway; prof. Copenhagen 1717, Baron 1746. His comedies still hold the stage; his *Peder Paars,* 1719, and *Subterranean Journey* (Latin), 1741, were very popular. *Hist. Denmark,* 1732–35; *Lives,* 1739–45; *Hist. Jews,* 1742; *Meditations,* 1744.

**Holcombe,** JAMES PHILEMON, 1824–1873. Prof. of Law Univ. Va. 1852–60. *Equity Jurisprudence,* 1846; *Law of Debtor and Creditor,* 1848.

**Holcroft,** THOMAS, 1745–1809. English playwright, novelist, and translator. *Road to Ruin,* 1792; *Memoirs,* 1815.

**Holden,** EDWARD SINGLETON, LL.D., b. 1846. Prof. U. S. Navy 1873, and Univ. Wis. 1881; Pres. Univ. Cal. 1886; director Lick Observatory 1888. *Sir W. Herschel,* 1881.

**Holden,** HUBERT ASHTON, LL.D., b. 1822. English editor of Cicero, Xenophon, and other classics.

**Holden,** ISAAC, b. 1807. Inventor of the lucifer match 1829, and of a machine for combing wool 1850; M.P. 1865–68, and from 1882.

**Holden,** OLIVER, 1765–1831. American editor of music-books; author of the tune *Coronation.*

**Holder,** JOSEPH BASSETT, M.D., 1824–1888. Zoölogist. N.

*American Fauna*, 1882.—His son, CHARLES FREDERICK, b. 1851, has written much on animals.

**Hölderlin,** JOHANN CHRISTIAN FRIEDRICH, 1770–1843. German poet. *Hyperion*, 1797–99.

**Holdfast.** Swelling in actinomycosis or lumpy-jaw. See ACTINOMYCES BOVIS.

**Holdsworth,** ANNIE E. English novelist. *Joanna Traill*, 1894.

**Holiday,** LEGAL. Day on which the law exempts people from the performance of various legal obligations, as attending court, giving and receiving legal notices. It generally originates and is regulated by statute. In U. S. the following legal holidays are quite general: New Year's Day, Washington's Birthday, Decoration Day, Independence Day, Thanksgiving Day and Christmas Day. In some States Lincoln's Birthday, Good Friday and Labor Day are also observed.

**Holing.** 1. In coal-mining, the undercutting of a seam.

Holing.

2. The breaking through of a rib or pillar to connect parallel passages in a mine.

**Holinshed,** RAPHAEL, d. ab. 1582. English chronicler. *Chronicles of Englande, Scotlande, and Ireland*, 1577.

**Holkar,** MELHAR RAO, 1693–1765. Ruler of w. Malwa, in central India, from 1736; founder of a powerful Mahratta family, extinct 1852.—His descendant, JESWENT RAO, d. 1811, defeated Doulat Rao Sindia 1802, and fought the British 1802–5.—His son, MELHAR RAO, Rajah of Indore 1811–33, became tributary 1818.

**Holl,** FRANK, 1845–1888. English genre and portrait-painter. A.R.A. 1878. R.A. 1883. Chief works, *Sacrifice of*

Deserted, by Holl.

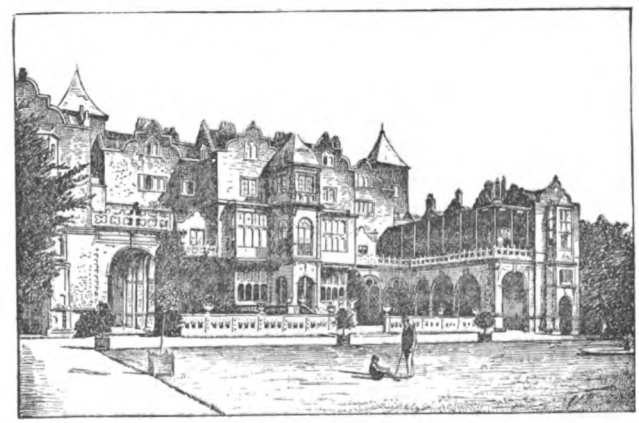
*Abraham*, 1863; *The Lord gave and the Lord hath taken away*, 1869; *No Tidings from the Sea*, 1871; *Deserted*, 1874.

**Holland** (properly THE NETHERLANDS). Country in n.w. Europe. The surface is everywhere low and level, a large part of it being below sea level and protected from the encroachments of the ocean by dykes along the shores and the river banks. The climate is exceedingly humid. Its area is 13,627 sq. m. The people are mainly engaged in manufactures and commerce. Of the former, the making of cotton, woolen, and silk goods and earthenware are prominent. Market-gardening and floriculture are pursued to a considerable extent. The government is a limited monarchy. The capital is The Hague. H. was early inhabited by Celts, of whom some became allies of the Romans, others tributary. The Salian Franks appeared in the 3d century, and afterward the Saxons. Christianity was introduced by Willibrod 695. The land was ruled by Dukes and Counts, became part of the German Empire 925, and was invaded by Northmen in 9th century. Its history proper opens with Dirk III., 1018–39. The struggle with Flanders began under Dirk IV. William, 1206–24, joined the fourth crusade and granted civic charters. William II. was crowned King of Germany 1248. The first line of Counts ended 1299. The line of Hainault began with John of Avennes. Under Margaret, 1345, began a struggle between nobles and cities, "Hooks and Cods." Jawba was compelled to resign H. and Zealand to Philip of Burgundy 1436. A period of material prosperity followed, but civil liberty declined. Diets were established under the "Great Privilege" of March 1477. The war of "Hooks and Cods" continued under Mary and Maximilian. Under Philip the Handsome, the "Great Privilege" was removed. In 1540 Charles V. made René of Chalons, prince of Orange, Stadtholder. In 1559 Philip II. began or enlarged a system of religious persecution which, with other abuses of power, led to the rebellion of the provinces. The malcontents adopted the party name of "Beggars" (Genses). The Duke of Alva, sent by Philip to subjugate the provinces, ruled with atrocious tyranny, through a "Council of Blood." Egmont and Horn were executed, and Orange was outlawed. Many patriots took refuge on the sea, assailing Spanish commerce, making attacks on land, taking Brill and other places, till Amsterdam was the only town in H. in Spanish hands. Alva advanced n., but was checked by the siege of Haarlem. Severe reverses followed and Alva was recalled. In 1575 H. and Zealand united under William of Orange. By the Union of Utrecht, 1579, the northern provinces, with some southern cities, were joined in closer union. In 1581 the seven northern provinces issued their declaration of independence. After William's assassination, July 10, 1584, his son, Maurice, became Stadtholder. The southern provinces had now been nearly subdued by Spain. The arms of Maurice prospered and a truce of 12 years was at length signed, leaving the Dutch lords of the sea. The theological struggle, ending in the Synod of Dort and the death of Barneveldt, was followed by the Thirty Years' War in Germany, in which H. took part. Peace was signed with Spain and the independence of the United Provinces recognized 1648. The office of Stadtholder was suspended after the death of William II., and the Grand Pensionary, De Witt, became virtual president of the Republic. The Navigation Act, 1651, occasioned war with England, followed by the treaty of Breda, 1667. The invasion by Louis XIV., 1672, led to the murder of the De Witts and proclamation of William III. as Stadtholder. He married Mary, daughter of James II., 1677, and by the revolution of 1688 became King of England. War was carried on from 1702 under Marlborough, Heinsius, and Eugene. By the peace of Utrecht, 1713, the Spanish Netherlands passed to Austria, and H.'s importance in European politics ended. The French invasion of 1793–95 led to the formation of the Batavian Republic. Napoleon created H. a kingdom 1804, and annexed it to France 1810. The Prince of Orange was made King of the Netherlands as William I., 1813. By the treaty of Paris, H. and Belgium were united; but Belgium revolted 1830, and became a separate kingdom 1839.

**Holland.** Fine linen originally manufactured there; now a brown coarse linen cloth used principally for furniture covers.

**Holland,** SIR HENRY, M.D., D.C.L., 1788–1873. Physician to the Queen 1852, Baronet 1853. *Travels*, 1815; *Medical Notes*, 1839; *Mental Physiology*, 1852; *Essays*, 1862; *Recollections*, 1871.

**Holland,** HENRY RICHARD (FOX) VASSALL-HOLLAND, F.R.S.,



Holland House, South Side.

third Baron, 1773–1840. Member of Whig cabinets 1806–7 and 1830–40; translator and biographer of Lope de Vega, 1806.

*Foreign Reminiscences*, 1850; *Memoirs of the Whig Party*, 1852. His house in Kensington had great social fame.

**Holland,** JOSIAH GILBERT, M.D., 1819–1881. American poet, novelist, and didactic writer; ed. Springfield, Mass., *Republican*, 1849–66; ed. *Scribner's Mag.* (now *The Century*) from 1870. *Hist. Western Mass.*, 1855; *Life of Lincoln*, 1865. As "Timothy Titcomb" he pub. *Letters*, 1858–63; *Gold Foil*, 1859, and other popular and useful books. His chief poems are *Bitter-Sweet*, 1858, and *Kathrina*, 1867; novels, *The Bay Path*, 1857; *Miss Gilbert's Career*, 1860; *Seven Oaks*, 1875.

**Holland,** PHILEMON, 1551–1636. English translator of Livy, Plutarch, and other classics.

**Holland,** ROBERT AFTON, D.D., b. 1844. Rector in St. Louis 1872–80 and since 1886; writer on philosophy and theology.

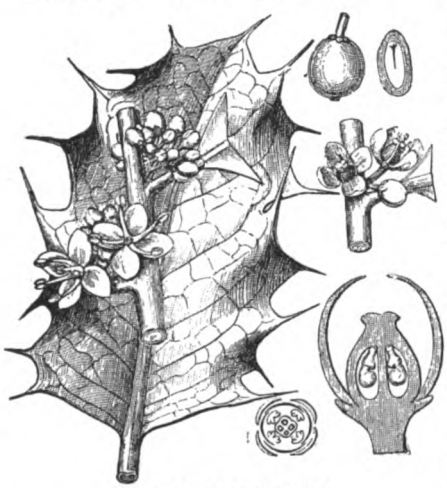
**Hollands.** See GIN.

**Hollar,** WENCESLAUS, 1607–1677. Bohemian-English engraver of high rank, neglected in his lifetime.

**Holles,** DENZIL, 1597–1681. M.P. 1624; imprisoned 1629–30; one of the five members who incurred the king's special wrath 1642; Presbyterian leader; in exile in 1647–58; made Baron 1661, for promoting the Restoration; a lover of liberty, dissatisfied alike with Stuarts, army, and Commonwealth.

**Holley,** ALEXANDER LYMAN, LL.D., 1832–1882. American engineer; introducer of the Bessemer process at Troy, N. Y., 1865–67. *Ordnance and Armor*, 1865.

**Holly.** Evergreen, spiny-leaved trees of the natural family *Aquifoliaceæ*. The European Holly is *Ilex aquifolium*, the N. American *I. opaca*.



Holly (*Ilex aquifolium*).

**Holly,** MOUNTAIN. *Iliciodes mucronata*. Shrub of the Holly family, native of swampy places in n. e. N. America.

**Hollyhock.** *Althæa rosea*. Tall, showy-flowered herb of the Mallow family, native of China; widely cultivated for ornament.

**Holly Springs.** Capital of Marshall co., Miss: General Grant's depot of supplies, captured by the Confederate, Gen. Van Dorn, Dec. 20, 1862; seat of Rust Univ. and other institutions of learning. Pop., 1890, 2,246.

**Holman,** JAMES, ab. 1787–1857. English traveler in Europe and Asia, blind from 1810; author of several *Journals*.

**Holman,** WILLIAM STEELE, b. 1822. M.C. from Ind. 1857–77 and 1881–93; called "watchdog of the treasury" and "the great objector."

**Holmboe,** CHRISTOPHER ANDREAS, 1796–1882. Prof. Christiania 1825–76; writer on Sanskrit and Old Norse.

**Holmby House.** Tudor mansion built in the time of Elizabeth, by Lord Chancellor Hatton, near Northampton, England. Here Charles I. was imprisoned 1647.

**Holmes,** AUGUSTA MARY ANNE, b. 1847 in Paris. Composer of symphonies, an opera, and other music.

**Holmes,** MRS. MARY JANE (HAWES). American novelist. *Lena Rivers*, 1856; *The Hepburn Line*, 1893.

**Holmes,** NATHANIEL, b. 1814. Law prof. Harvard 1868–72. His *Authorship of Shakespeare*, 1866–86, ascribes the plays to Bacon.

**Holmes,** OLIVER WENDELL, M.D., LL.D., 1809–1894. American poet, essayist, and novelist; Prof. of Anatomy at Dartmouth 1838, and at Harvard 1847–82. In science he has pub. *Currents and Counter-Currents*, 1861, *Border-lines*, 1862, *Mechanism in Thought and Morals*, 1870. As a humorous and occasional poet he is unsurpassed. His chief fictions are *Elsie Venner*, 1861, and *The Guardian Angel*, 1868. His most eminent success was *The Autocrat of the Breakfast Table*, 1859, followed by *The Professor*, 1860, and *The Poet*, 1872. These and much more of his work first appeared in *The Atlantic*.—His son and namesake, b. 1841, Judge Mass. Supreme Court since 1882, pub. *Common Law*, 1881.—His father, ABIEL, D.D., 1763–1837, pub. *Annals of America*, 1805–29.

**Holmes,** WILLIAM HENRY, b. 1846 in Ohio. Geologist of Western surveys 1872–82; connected with the Smithsonian Institute; prof. Univ. Chicago 1892. His later labors are chiefly in archæology and ethnology.

**Holmium.** One of the doubtful elements, found by Cleve with erbium; it has a yellow oxide and at.wt. 162.

**Holoblastic Ova.** Those which undergo complete segmentation to form the blastoderm.

**Holocephali.** Sub-order of *Selachii*, including forms having large eyes without lids, and a small mouth under the snout, with four teeth above and two below. The skin is naked, there are no spiracles, and only one gill-slit on each side. The maxillo-palatine (palato-quadrate) bar is firmly fused to the skull, and the lower jaw articulates with a styliform process (hyomandibular) of the skull. They lay eggs in horny cases. The CHIMÆRA (q. v.) or Sea-Cat is an example.

**Holochlamyda** (HOLOSTOMATA). Division of Prosobranchs, including forms with the aperture of the shell entire. There are three sub-groups, *Rhipidoglossa*, *Ptenoglossa*, and *Tænioglossa*, in part.

**Holometabola.** Division of Insects, including the orders *Diptera*, *Hymenoptera*. *Lepidoptera*, *Strepsiptera*, and *Coleoptera*, and sub-orders *Aphaniptera*, *Tanystomata*, etc. These all undergo complete metamorphosis. The egg hatches into a worm-like larva (grub or caterpillar), which is the usually active, feeding, and growing stage. Next follows the pupa stage (chrysalis or cocoon), when the organs of the next stage are gradually shaped out of the pre-existent organs, often accompanied by histolysis. This is a quiescent period. Then follows the imago, the perfect and usually winged mature insect, which often has a comparatively brief life, but long enough to lay the eggs that produce the next generation, which begins the larval stage over again. This is simply a case of embryonic development broken up into periods.

**Holophytic Nutrition.** See HOLOZOIC NUTRITION.

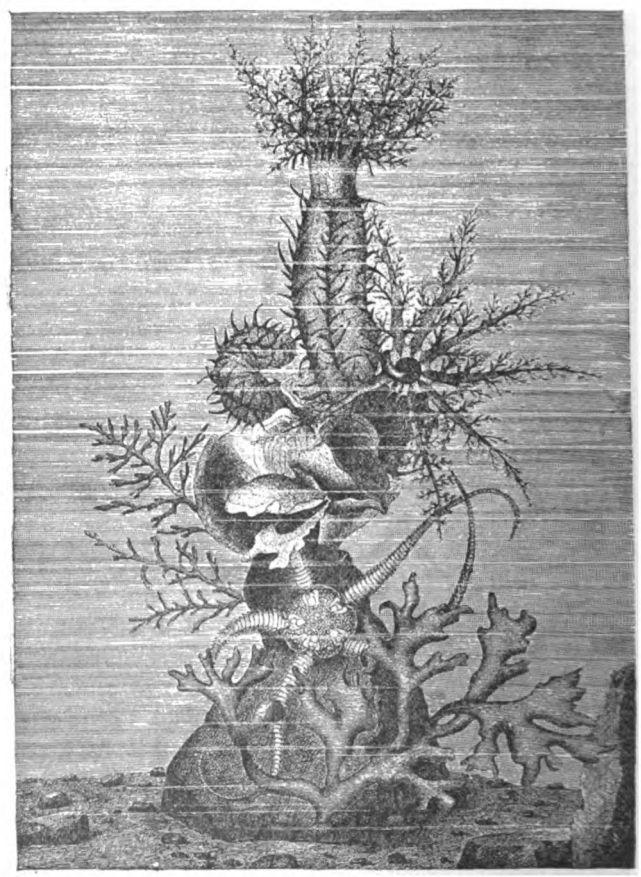
**Holoptychius.** Crossopterygian lepidoganoid Devonian fish, with large sculptured circular scales and dendrodont teeth; formerly confounded with *Megalichthys* and *Rhizodus*.

**Holostei.** Group of Ganoids, including forms having the skeleton bony; divided into the sub-groups EUGANOIDES and AMIADES (q. v.).

**Holostomata.** See HOLOCHLAMYDA.

**Holostomous.** Having the shell aperture entire or rounded, as in certain univalves.

**Holothuroidea** (SEA CUCUMBERS). Echinoderms with



Holothuroidea.

slug-shaped or worm-like bodies, with leathery skin containing scattered spicules, and the ambulacral areas indistinctly marked into a dorsal (bivial) and a ventral (trivial) surface. The mouth is at one end, surrounded by branched tentacles; the anus is at the other. The sexes are usually distinct. Some have large respiratory trees. They are divided into the *Apoda* and *Pedata*, or the *Apneumona*, *Dipneumona*, and *Tetrapneumona*. See also ELASIPODA.

**Holotricha.** Ciliates with bodies uniformly covered with short cilia, often in longitudinal rows. *Paramœcium* is an example.

**Holotrocha.** Order of Rotifers, possessing an anus and a rounded entire trochal disk.

**Holozoic Nutrition.** That which is characteristic of animals. It involves ingestion of complex foods, containing proteids, and carbonaceous materials: it also involves digestion, absorption, and assimilation of these substances, and concomitant disassimilation, resulting in the production of water, carbon dioxide, and ammoniacal or urea compounds, to be excreted. It is opposed to holophytic nutrition of the chlorophyl-bearing plants, which, in the presence of sunlight, feed on the animal wastes, building them up into complex compounds again.

**Holst,** HANS PETER, 1811–1893. Danish poet, dramatist, and novelist.

**Holst,** HERMANN EDUARD VON, Ph.D., b. 1841 in Russia. Prof. Strassburg 1872, Freiburg 1874, Univ. Chicago 1892. *Constitutional and Political History U. S.*, 1873–78, tr. 5 v. 1876–85.

**Holstein.** See SCHLESWIG.

**Holstein.** See CATTLE.

**Holsten,** KARL CHRISTIAN JOHANN, b. 1825. Prof. Berne 1871, Heidelberg 1876; writer on the Gospels and Epistles.

**Holston.** River formed by two forks rising in s. w. Va., thence flowing ab. 200 m. in e. Tenn., and uniting with the Clinch to form the Tennessee.

**Holt,** SIR JOHN, 1642–1710. Recorder of London and Knight 1666; Chief-justice of King's Bench from 1689; eminent for justice, courage, and ability.

**Holt,** JOSEPH, b. 1807. U. S. Postmaster-gen. 1859; Sec. of War 1860–61; Judge-advocate-gen. 1862–75.

**Holtei,** KARL VON, 1798–1880. German dramatist, novelist, and poet. *The Vagabonds*, 1851.

**Hölty,** LUDWIG HEINRICH CHRISTOPH, 1748–1776. German lyric poet.

**Holtzendorff,** FRANZ VON, 1829–1884. Prof. Berlin 1861 and Munich 1873; writer on law and penology.

**Holtzmann,** ADOLF, 1810–1870. Prof. of German at Heidelberg 1852; writer on philology. *Kelten und Germanen*, 1855. —His son, HEINRICH JULIUS, b. 1832, Prof. of Theology at Heidelberg 1861 and Strassburg 1874, has pub. much on N. T.

**Holy Alliance.** Treaty formed 1815 by Russia, Austria, and Prussia, for preservation of relations between the European nations, and exclusion of the Bonaparte family from any European throne. It was a tool of absolutism.

**Holy Coat of Treves.** Supposed seamless garment of Christ, said to have been taken by ST. HELENA (q.v.) ab. 325 to Treves, where it is kept in the cathedral; first mentioned 1054.

Holy Coat of Treves.

**Holy Communion.** See EUCHARIST.

**Holy Communion,** SISTERS OF THE. P. E. order of nurses, founded by Dr. Muhlenberg 1845 in N. Y.

**Holy Cross,** COLLEGE OF THE. At Worcester, Mass.; founded 1843, incorporated 1865. It has a 7 years' course, 17 instructors, and 330 students, and is conducted by Jesuits.

**Holy Cross,** CONGREGATION OF THE. Founded in France 1834. Since 1842 it has many houses in the U.S. A sisterhood was formed 1834 in Belgium. They have a college at Watertown, Wis.

**Holy Cross Mountain.** Summit in the Sawatch range, Col., named from a cross of snow on its e. face. Altitude 14,176 ft.

**Holy Family.** Virgin Mary and Child Jesus, often represented in paintings with St. Joseph and other figures. This

Holy Family, by Rubens (Pitti Gallery).

picture contains St. Elizabeth and St. John, in addition to those mentioned.

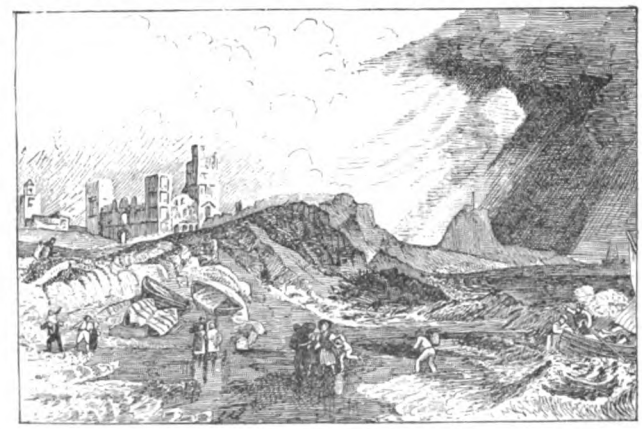
**Holy Ghost.** Spirit of God, regarded by most Christians as Third Person of the Trinity; stated in Nicene Creed to proceed from the Father and the Son.

**Holy Ghost,** ORDERS OF THE. Founded 1178, 1212, 1254, 1588, and 1703. Some of them still exist for charitable and missionary work. See SAINT ESPRIT.

**Holy Grail,** or SANGREAL. Cup supposed to have held the wine at the institution of the Lord's Supper. The legend has it that in it Joseph of Arimathea received some of Christ's blood. The quest for it was a main object of the Knights of Arthur's Round Table.

**Holyhead.** Mail steamboat station to Ireland in w. Anglesea, Wales. The harbor and breakwater were completed 1873. Pop., 1891, 8,700.

**Holy Island,** or LINDISFARNE. Small island, area 4 sq. m., off the coast of Northumberland, Eng.; seat of the famous



Holy Island.

Benedictine priory where St. Cuthbert lived. The ancient cathedral ravaged by the Danes dated from the 7th century.

**Holy Junta.** Central committee which directed an insurrection against Charles I. of Spain, aiming at a constitutional monarchy. The movement was crushed on the field of Villalar, April 23, 1522.

**Holy Land.** See PALESTINE.

**Holy League.** Sundry alliances, much more secular than sacred, formed 1511, 1538, 1571, and at later dates. The chief of them was that between the Guises, Philip II. of Spain, and the Pope, which kept France in turmoil from 1576 till Henry IV. broke its power at Ivry 1590.

**Holyoake,** GEORGE JACOB, b. 1817. English labor reformer; imprisoned for "blasphemy" 1841; founder of secular and co-operative associations; ed. *Reasoner*. *History of Co-operation*, 1875–79; *Sixty Years of an Agitator's Life*, 1892.

**Holy Office.** See INQUISITION.

**Holyoke.** City of Hampden co., Mass., on the right bank of the Connecticut. Its manufactures are extensive, consisting of cotton and woolen fabrics, iron and steel, paper, etc., the power being furnished by the Connecticut R. It was set off from Springfield 1850, and chartered 1873. Pop., 1890, 35,637, half of foreign birth.

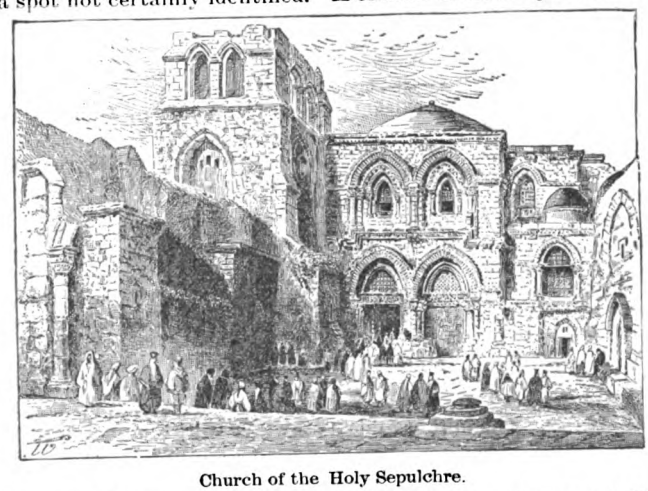
**Holy Place.** Apartment of the Jewish temple, into which only priests might enter, containing the table of shew-bread, golden candlestick, and altar of incense; separated by a curtain from the Most Holy Place, or Holy of Holies, to which the High Priest alone had access once a year.

**Holy Roman Empire.** German empire, so styled under Otho I., crowned at Rome, Feb. 2, 962.

**Holy Rood.** True Cross; festival to commemorate the recovery of a large piece of the Cross by Heraclius, 615. The feast of the Invention of the Cross is on May 3d, that of the Exaltation, Sept. 14th.

**Holyrood.** Abbey in Edinburgh, founded 1128; repeatedly burned, and in ruins since 1768; named from a supposed fragment of the true Cross, preserved there till ab. 1540. The adjoining palace was begun 1501, and played a prominent part in Scottish history.

**Holy Sepulchre.** Tomb of Christ, outside Jerusalem, at a spot not certainly identified. A church erected by Constantine 326–335 over a cave, the supposed site, was repeatedly destroyed and rebuilt.



Church of the Holy Sepulchre.

**Holy Sepulchre,** ORDERS OF THE. Founded 1114 and later, and once numerous.

**Holy Thursday.** Ascension Day.

**Holy Wars.** See CRUSADES.

**Holy Water.** In R. C. and Eastern Churches, used for sprinkling; an ancient custom, probably borrowed from Jews and pagans.

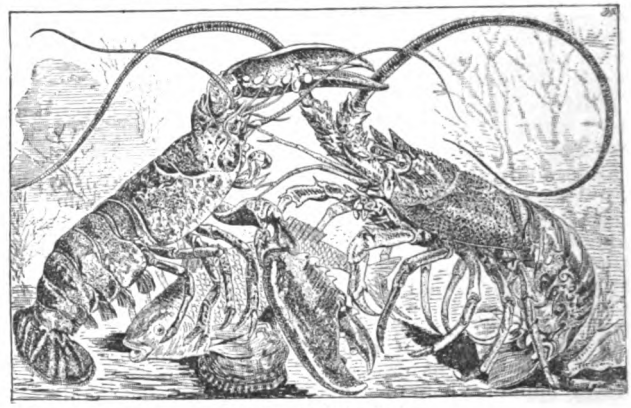
**Holy-Water Pot.** Small metal ornamental bucket used in the R. C. Church to contain the consecrated water. The aspergillum was dipped into it to sprinkle the water around.

**Holy-Water Stoup.** Stone basin in the wall beside, or just within, the church doors, containing holy water for the use of the congregation entering or leaving.

**Holy Week,** or PASSION WEEK. Palm Sunday to Easter Eve, concluding Lent.

**Homage.** Services of reverence by which a free tenant pledged himself to become his lord's man "from that day forward, of life, and limb, and earthly honor": it could be done only to the lord in person, while fealty might be done to his representative.

**Homarus** (LOBSTER). It has the general characters of the Crayfish, differing mainly in the number and arrangement of the gills. When ab. 10 in. long it lays ab. 10,000 eggs of a dark color, which become attached to the swimmerets. The eggs develop slowly, and a year may elapse before the lobster leaves deep water and succeeds in hatching a brood, near shore. This usually occurs in June, though (like oysters, of which some may spawn late in August) the hatching may be delayed. After hatching a brood, the lobster moults its shell and comes out as a "paper-shell": a month elapses before the new shell is firm. The moulting is sometimes delayed until the following summer, when a new batch of eggs are laid, the male having first deposited the sperm on the abdomen of the female. In 1880 the lobster fishery from Maine to New Jersey yielded a return of nearly $500,000.



Lobster and Crayfish.

**Homaxonia.** Organisms like *Volvox*, which are spheres, all the axes of the body being alike.

**Homburg.** Town of Hesse-Nassau, 8 m. n. of Frankfort; noted for its medicinal springs, and till 1872 for its gaming-tables. Pop., 1890, 8,863.

**Home,** DANIEL DOUGLAS, 1833–1886. Scottish spiritualist, in the U. S. 1840–55; supposed original of Browning's *Mr. Sludge;* author of several autobiographies.

**Home,** HENRY. See KAMES.

**Home,** JOHN, 1722–1808. Scottish dramatist. His tragedy, *Douglas*, acted 1756, pub. with *Agis* and *The Siege of Aquileia*, 1760, was vastly admired, but caused his retirement from the ministry.

**Homeopathy.** System of medicine originated by Hahnemann, who regarded disease as a dynamic derangement of health, not as an entity, and taught that disease may be cured by a drug which produces a similar condition when administered to a well person, or that "like cures like"; that the efficiency of drugs is increased by their attenuation, that is, dilution with large amounts of some inert substance; that the mechanical processes of attenuation "potentialized" or developed their "spiritual power," and that the effect of small doses frequently repeated was much greater than that of larger amounts at less frequent intervals. Opponents of homeopathy contend that the effects of a drug upon the sick cannot be measured by those upon the well, that the majority of cures said to be due to homeopathy would have occurred without any treatment, and that disease must be regarded as more or less of an entity. Whether the theories of Hahnemann were right or wrong, any candid opponent must admit that he did good service in calling attention to many valuable drugs, such as belladonna, aconite, and nux vomica, to the utility of small doses frequently repeated, to the importance of experimenting as to the effects of drugs, to the greater value of fresh vegetable drugs over the dried, and to the importance of the careful preparation of medicines. At the present time the line between practical homeopathy and other systems is not very clearly defined, and members of all schools borrow freely from the experience of others.

**Homer.** Tradition assigns the Iliad and the Odyssey, the great epics upon the time of the Trojan war, together with other poems no longer extant, to a writer of this name, whose date is uncertain, Herodotus expressing the opinion that he lived not more than 400 years before his day; *i.e.*, ab. 850 B.C. Several cities claimed the honor of giving him birth, and legends tell us the mythical details of his life. Until the close of the last century the critical editors went no further than to recognize the difference between the Homeric Hymns, formerly considered to be his work, and the two great epics. In 1795 F. A. Wolf published his Prolegomena to Homer, in which he questioned the authenticity of the traditional origin of these poems. He claimed that they could not have been committed to writing at so early a date, and the bulk seemed to him too great to be transmitted by word of mouth. A third objection lay in his idea of the loose unity

of the poems; his conclusion was that these two poems were composed of a number of shorter ones, which were afterward joined by the rhapsodists or by Peisistratus at Athens. The question thus started has occupied scholars for a century, some of whom considered the author of the Iliad not to have written the Odyssey. Many believe that each poem had a nucleus to which episodes were added. Nitsch championed a much more moderate position. The more conservative contend for the practical integrity of the poems and the historical character of Homer. The style of these poems affords grounds for believing at least the principal portions to spring from one man. The general characteristics agree, and the tone is harmonious. The language is noble, the interest sustained, and the graphic word painting, joined to the naturalness and vividness of the action, have caused them to be recognized as the masterpieces and models of epic poetry. See ILIAD and ODYSSEY.

Apotheosis of Homer by Archelaus of Priene.

**Homer,** WINSLOW, b. 1836. American landscape, marine, and genre painter, one of the most genuine and powerful of all American artists. Many of his pictures were at the World's Columbian Exposition, Chicago.

**Homeric Hymns.** Collection of Greek poems, each dedicated to a divinity and narrating some legend regarding him; traditionally assigned to Homer, but regarded as of later origin.

**Home Rule.** Autonomy demanded by Irish Nationalists. The Home Government Association was established at Dublin 1870, and Isaac Butt first led the party, which became very obstructive in Parliament 1877. William Shaw succeeded to the leadership 1879; Charles S. Parnell was elected chairman 1880 and conducted the movement with marked ability and success, till a private scandal alienated his English followers and disrupted the party 1890. The Lords defeated Gladstone's Home Rule bill 1893, and the return of a Tory government 1895 temporarily shelved the question.

**Homestead Laws.** In the U. S., laws to give lands still unsold to those who intend to become settlers, free of cost, except for small office fees. The first homestead act became a law 1862, and many million acres have been taken up under it. The influence of these laws has been very great on immigration and on migration from the East, as well as on Western society. Other laws, varying greatly in different States, are intended to restrict the alienation of a family's home and secure it against the claims of the owner's creditors.

**"Home, Sweet Home."** The words of this admired song were written by John Howard Payne for the opera *Clari; or, The Maid of Milan*, which HENRY R. BISHOP (q.v.) set to music 1823. Bishop published the melody as a "Sicilian air," but afterward claimed that it was original with him. Donizetti introduced the melody into his opera *Anna Bolena*.

**Homicide.** Killing a human being; justifiable when lawfully committed by an officer, or in the prevention of a forcible and atrocious crime; excusable when the accidental result of a lawful act, or of an act of defense of self, spouse, child, parent, or servant. For felonious homicide, see MANSLAUGHTER and MURDER.

**Homildon Hill.** In Northumberland. The Scots under Douglas were defeated here Sept. 14, 1402, by Hotspur and Earl of March, and several noblemen taken prisoners.

**Homiletics.** Art of preaching; department of practical theology treating of the preparation and delivery of sermons; first handled by Augustine and Chrysostom; sometimes called Sacred Rhetoric.

**Homilies.** Sermons, especially those put forth by Cranmer and Jewell 1547–63 to be used by the clergy, many of whom, by ignorance or Roman leanings, could not then be trusted to prepare their own discourses.

**Hominidæ.** See ANTHROPIDÆ.

**Homo.** See ANTHROPIDÆ.

**Homoblastic.** Embryo of seeds when in its normal position.

**Homobrontes.** Lines connecting localities around an advancing thunderstorm at which the first thunder is heard simultaneously; term introduced by Von Bezold.

**Homocarpous.** Plants whose fruit is all of one kind.

**Homocercal.** Having two equal lobes to the tail fin, though the notochord may be bent up into the upper lobe. Compare DIPHYCERCAL.

**Homodont Dentition.** Teeth all alike, as in whales.

**Homodromous.** Organs which coil or are spirally arranged in but one direction.

**Homodynamy.** Homodynamous, of equal rank or power, as the segments of an Arthropod or an earthworm.

**Homogamous.** Flowers of plants of the Composite family when all of the same sex.

**Homogeneity.** Sameness of nature or uniformity of structure. A body is called homogeneous when any two equal similar parts of it, with corresponding lines parallel and turned toward the same parts, are undistinguishable from one another by any difference in quality.

**Homogeneous Expression.** One having all its terms of the same degree, as $x^3+3x^2y-xy^2+y^3$.

**Homogeneous Metal.** Made by the SIEMENS-MARTIN or OPEN-HEARTH PROCESS (q.v.); see also STEEL. It is either ingot iron or ingot steel, and is applicable for boilers and other similar uses because of its homogeneity and freedom from the defects of welded metal, in which blisters are liable to occur under action of heat.

**Homogeneous** (or UNIFORM) **Strain.** In any medium, when such that all parallel lines within the strained body are altered in length in the same ratio.

**Homogenesis.** That form of biogenesis in which the child passes through the same stages as the parent, or resembles the parent almost perfectly. Opposed to ALTERNATION OF GENERATIONS (q. v.).

**Homogenetic.** Of equal or similar origin; having similar relations to a fundamental type.

**Homogonous.** Flowers whose stamens and pistils are all of the same structure.

**Homographs.** Words identical to the eye, but different in source, in signification, and usually in pronunciation. See HOMONYMS and HOMOPHONES.

**Homology.** Similarity in essential structure, origin, and relations; opposed to analogy, which is only superficial similarity of structure, due to similarity of function. Homologous organs may look very unlike, owing to differences in their function. The arm of man and the wing of a bird are homologous; so, also, are the hands and the feet of any person; but this is distinguished as serial homology or homodynamy.

**Homology.** In Geometry, figures are homologous when they are projections of one and the same figure on one and the same plane, but from different centers of projection. Straight lines joining corresponding points meet at a common point (center of homology), and corresponding lines intersect in a straight line locus (the axis of homology).

**Homomorphic.** Of similar external form.

**Homomyaria.** See ISOMYA.

**Homonomous.** Of like value, as the different fingers of one hand with each other; also homologous structures when developed to nearly the same degree and similarly. See PARAMERES.

**Homonyms.** Words identical to the eye and ear, but different in source and signification; frequent in English.

**Homoousion.** Term expressing the Consubstantiality of the Son with the Father, established, as against Arianism, by First General Council, 325, at Nicæa. The opposing word, Homoiousion, meant of similar (not the same) substance: these two were war cries for the rival parties at Alexandria.

**Homophones.** Words identical to the ear, but different in spelling, as in source and meaning.

**Homophylitic.** Of similar origin; a sort of homology due to descent from a common ancestor.

**Homoplastic.** Evolved in a similar manner but independently, as the septum of the ventricle of the heart in Crocodiles, Birds, and Mammals.

**Homoplasy.** Independent evolution of similar structures. The most remarkable instance is afforded in the case of eyes; *e.g.*, cuttlefishes and vertebrates are independent evolutions along totally distinct and dissimilar lines, yet the structure of the eye is nearly the same in both groups.

**Homopola.** Organisms having a longitudinal axis with similar poles, and also cross axes; the latter are alike in the isostaura and unlike in allostaura.

**Homoptera** (CICADARIA). Sub-order of *Rhynchota*. These insects have large heads, plump bodies, and large wings, usually alike; sometimes the front pair are coriaceous and colored. They lie, when at rest, obliquely on the body. The rostrum arises from the head near the front legs. Some have the hind legs adapted for springing. An ovipositor is present. The eggs are laid beneath the bark of plants. The larva feeds on roots, and sometimes lives many years before its metamorphosis, as in the Seventeen-year Locust. The family is also called *Stridulantia*, because the base of the abdomen in the male carries an organ for producing a shrill chirp. *Cicada orni* of Sicily produces, by its puncture, a flow of vegetable juices called Manna.

Homoptera.

**Homosporous.** See ISOSPOROUS.

**Homostaura.** Organisms with radial heteropolar symmetry; if each diameter has similar radii, as in the Polyps, they are Isopola; but if each diameter is a radius on one side, an inter-radius on the other, as in echinoderms, the forms are Anisopola.

**Homotaxis.** Applied by Huxley to similarity of position in a series of rocks.

**Homothermic.** Having a uniform temperature, as in warm-blooded animals that do not hibernate.

**Homothetic Figures.** In Geometry, homologous figures which are similar and similarly placed. The axis of homology is the line at infinity and the center of homology is the center of similitude.

**Homotypical.** Of similar value in the structure of an organism; *e. g.*, the antimeres with one another.

**Homozoic.** Two regions having the same fauna.

**Homs**, or HUMS. Anciently Emesa; in Syria, on the Orontes; once famous for its temple of the sun. Zenobia was defeated here by Aurelian 273, and the Turks defeated by Ibrahim Pasha and the Egyptians, July 8, 1832. Pop. ab. 30,000.

**Hondekoeter,** MELCHIOR D', 1636–1695. Dutch painter of birds. Good examples of his work are in Amsterdam and in the New York Metropolitan Museum. He made a particular study of dead birds, which he painted with singular truthfulness.

The Fox, by Hondekoeter (Louvre).

**Honduras.** Republic of Central America; area 46,500 sq. m. The n. part is low, the country rising into mountains near the s. border. It is covered with forests, in which are found mahogany and rosewood, which form important articles of export. The agricultural products consist of sugar cane, coffee, and tropic fruits. The capital is Tecucigalpa. This was the first American mainland which Columbus touched, 1502. It was explored by Cortes ab. 1520. H. was under Spanish rule until 1821, and in 1839 became an independent state. Its present constitution was adopted in 1865. Pop., 1889, 431,917.

**Honduras,** BRITISH. See BELIZE.

**Honduras,** GULF OF. Arm of the Caribbean Sea between Honduras and the Yucatan peninsula.

**Hone,** WILLIAM, 1780–1842. English satirist and compiler, prosecuted 1817 for his *Reformist's Register*. His *Apocryphal N. T.*, 1820, and *Ancient Mysteries*, 1823, were in the skeptical interest. His *Every-day Book*, 1826, *Table-book*, 1827–28, and *Year-book*, 1829, were full of antiquarian lore.

**Honesty.** *Lunaria biennis.* Herb of the Mustard family, producing large round pods; native of Europe, extensively planted in gardens.

**Honey.** See NECTAR and APICULTURE.

**Honey Badger.** See RATEL.

**Honeybirds.** 1. Woodpecker-like bird of S. Africa, which guides the natives to nests of bees, and receives its share of the honey found. 2. Passerine birds of the family *Meliphagidæ*, that resemble HUMMINGBIRDS (q.v.) in being adapted to secure nectar and insects from flowers.

**Honey Stone.** Name given to the mineral MELLITE (q.v.).

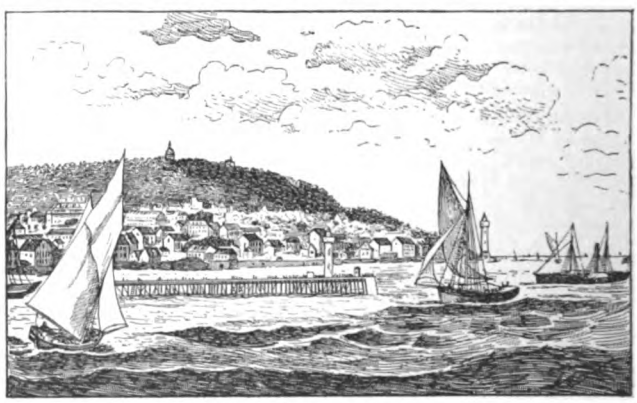
**Honeysuckle.** Vines and shrubs of the genus *Lonicera*, with showy and often odorous flowers, natives of the n. hemisphere; also known as Woodbine, especially the climbing species.

**Honeysuckle,** FALSE. See AZALEA.

**Honeysuckle,** SWAMP. *Rhododendron viscosum* (*Azalea viscosa*). Showy white-flowered shrub of the natural order *Ericaceæ*, native of swamps in e. N. America; known also as Clammy Azalea.

**Honeywort.** *Deeringia canadensis.* Insignificant white-flowered woodland herb of the Carrot family, native of e. N. America.

**Honfleur.** French seaport opposite Havre on the estuary of the Seine, with considerable export trade with England of farm and dairy produce. It has also manufactures of leather, iron, sugar, rope, and shipbuilding. Pop., 1891, 8,700.


Honfleur.

**Hong-Kong.** Island near the mouth of the Canton River, s. China; ceded to Great Britain 1841; ab. 9 m. long by 4 wide. It is a free port and a great commercial center. Pop., 1891, 221,441, of whom 8,545 were Europeans and Americans.

**Honiton.** Borough of Devonshire, noted for the manufacture of pillow-lace, introduced from Flanders ab. 1550. Pop., 1891, 3,216.

**Honolulu.** Capital and a seaport of the Sandwich Islands, on the s. side of Oahu. Pop. 20,487.

**Honorable.** Title borne by the sons and daughters of Earls (except the heir), Viscounts and Barons. Members of the Privy Council and Ministers of State are called Right Honorable.

**Honorius,** FLAVIUS, 384–423. Second son of Theodosius; Emperor of the West from 395.

**Honorius I.** Pope 625–638; condemned by Sixth General Council 680, and by Pope Leo II. 682, as a Monothelite heretic. Many writers think his case was misunderstood.—II. 1124–1130; also an antipope 1061–64.—III. Cencio Savelli, pope 1216–27.—IV. Giacomo Savelli, pope 1285–87.

**Honors of War.** Terms conceded to an enemy whose gallant defense of a fortress has induced the victor to allow the evacuating force to march out under arms, with colors flying, drums beating, or similar concessions.

**Hontheim,** JOHANN NIKOLAUS VON, 1701–1790. Bp. suffragan of Treves 1748–88. Besides 5 vols. on local history, 1750–57, he pub. *J. Febronii Icti de statu ecclesiæ*, 1763, which set councils above popes. It was widely read in several languages, placed on the Index, and the author forced 1778 to recant.

**Honthorst,** GERARD VAN, 1590–1656. Dutch painter of candle light and night scenes, considerably influenced in his

The Dentist, by Honthorst (Dresden Gallery).

methods by travel in foreign countries, especially Italy. He worked at the courts of various kings. For Charles I. he executed historical paintings for the Banqueting Hall, Whitehall.

**Honved.** Militia of Hungary since 1848.

**Hood.** Head-covering sometimes attached to the cloak or tunic and sometimes separate. It was universally worn in the Middle Ages, and took fantastic shapes, sometimes reaching to the waist behind.

**Hood,** JOHN BELL, 1831–1879. Lieut.-gen. C.S.A.; engaged in Va., Tenn., and Ga.; defeated by Schofield at Franklin, Tenn., Nov. 30, 1864, and by Thomas, Dec. 15 and 16, at Nashville. *Advance and Retreat*, 1880.

**Hood,** ROBIN. English outlaw and legendary hero, celebrated in ballads since ab. 1375; not identified, and probably mythical.

**Hood,** SAMUEL, R.N., 1724–1816. Naval tactician, distinguished in wars with France; Baronet 1778, Rear-admiral 1780, M.P. 1784, Viscount 1796.—His brother, ALEXANDER, 1727–1814, won similar successes, becoming Admiral 1780, Baron Bridport 1796, and Viscount 1800.

**Hood,** THOMAS, 1799–1845. Eng. humorist and poet. The pathetic lyrics, *Song of the Shirt* and *Bridge of Sighs*, are among his latest pieces. These and some of his earlier work, notable for delicacy, dignity, and tenderness, are in strong contrast to the versified puns by which he was often compelled to earn his bread.

**Hood,** MOUNT. Extinct volcano in the Cascade range of Oregon. Elevation 11,225 ft.

**Hood-Molding,** or LABEL. In Gothic Architecture, the projecting molding bounding the outside of an arch or lintel.

**Hooft,** PIETER CORNELISSEN, 1581–1647. Dutch historian, dramatist, and poet, imitator of Tacitus and Seneca. His *Hist. Netherlands*, 1642, is still valued. *Henry IV.*, 1626.

**Hoogh,** or **Hooch,** PIETER DE, ab. 1632–1681. Dutch painter of domestic scenes.

**Hooghly,** or HUGLY. 1. W. outlet of the Ganges; ab. 150 m. long, 12 m. wide at its mouth. Its navigation below Calcutta is difficult and at times dangerous. 2. Town 25 m. n. of Calcutta, seat of a college.

**Hook,** JAMES CLARKE, b. 1819. English painter, chiefly of seaside scenes; R.A. 1860.

**Hook,** THEODORE EDWARD, 1788–1841. English humorist, author of farces, dramas, and novels; noted for his practical jokes. *Sayings and Doings*, 1825–28.

**Hook,** WALTER FARQUHAR, D.D., F.R.S., 1798–1875. Vicar of Leeds 1837, Dean of Chichester 1859; very active both in Ch. extension and literary work. *Ch. Dictionary*, 1841; *Eccles. Biography*, 8 vols., 1845–52; *Archbishops of Canterbury*, 12 vols., 1860–76.

**Hookah.** Indian pipe and smoking apparatus. The smoke is drawn through water and the noise gives rise to

Hookah.

the European name hubble-bubble. The tube and vase are often of silver and richly sculptured and the mouthpiece of amber.

**Hooke,** ROBERT, 1635–1703. English experimental physicist. Robert Boyle's assistant in the construction of his air-pump 1656; rival of Huygens for the honor of inventing the balance spring for regulating watches; curator of experiments to the Royal Society from 1662, and its sec. 1677–82. He was the first to state clearly that the study of the heavenly bodies must be regarded as a mechanical problem. He originated the idea of using a pendulum to measure the intensity of gravity. *Micrographia*, 1664; *Lectiones Cutlerianæ*, 1674–79; *Posthumous Works*, 1705.

**Hooker.** Small one-masted coasting or fishing-boat similar to the Hoy; used also by pilots on the Irish coast.

**Hooker,** JOSEPH, U.S.A., 1814–1879. Commander of the First Corps at S. Mountain and Antietam 1862, of the Army of the Potomac Jan.–June, 1863; defeated at Chancellorsville May 2–3; in command of 20th Corps in Tenn. and Ga. 1863–64; retired as Major-gen. 1868.

**Hooker,** SIR JOSEPH DALTON, M.D., LL.D., D.C.L., F.R.S., b. 1817. Son of Sir W. J. and his successor at Kew Gardens 1865; knighted 1877. *Flora Antarctica*, 1844–47; *Flora Novæ Zealandiæ*, 1853–55; *Flora Indica*, with T. Thomson, 1855; *Flora of British India*, 1872–95.

**Hooker,** RICHARD, 1554–1600. English divine, defender of Elizabethan Anglicanism, in his famous *Ecclesiastical Polity*, whose First Book Pope Urban VIII. declared "worthy to endure until the last fire shall consume all learning." Books I.–IV. appeared 1594, V. 1597. The genuineness of VI.–VIII., 1617–48, has been questioned.

**Hooker,** THOMAS, 1586–1647. First minister of Hartford, Conn., 1636.

**Hooker,** SIR WILLIAM JACKSON, LL.D., D.C.L., F.R.S., 1785–1865. Prof. of Botany at Glasgow 1820; knighted 1836; director of the Botanical Gardens at Kew from 1841. *Flora Scotica*, 1821; *British Flora*, 1830–42; *Flora Boreali-Americana*, 1833–40; *Icones plantarum*, 1827–54; *Species Filicum*, 1846–64; *Niger Flora*, 1849; *Victoria Regia*, 1851; *British Ferns*, 1861.

**Hooke's Anemometer.** Instrument consisting of a plate of metal hung as a pendulum broadside to the wind; its deflection from the vertical was measured in degrees. It was first described 1666, and is ascribed also to Sir Christopher Wren.

**Hooke's Law.** At the foundation of the mathematical theory of the elasticity of solids; pub. 1676 by R. Hooke in an anagram at the end of his *Descriptions of Helioscopes*, viz., ceiiinossttuu. A key to this anagram is found in the Latin words, "Ut tensio sic vis," now understood to mean that distortion is proportional to the force producing it. An experience indicating the truth of this law is familiar to everyone. The pitch of a tuning fork does not change as the amplitude of vibration grows less; the vibrations must therefore be isochronous, which is possible only if the force of restitution is proportional to the displacement.

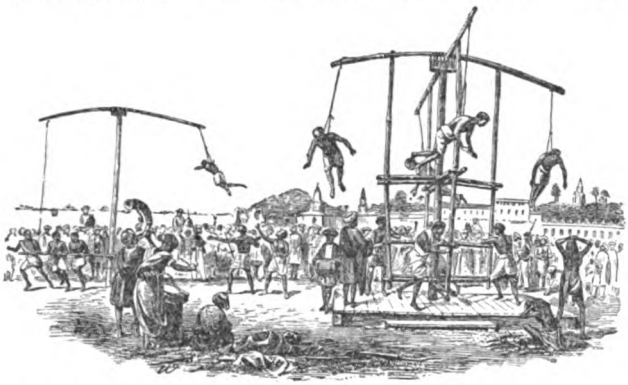
**Hook Gauge.** Instrument for precisely determining the elevation of the surface of water by means of a pointed hook

attached to a graduated scale; mainly used for measuring the depths above the crest of weir; invented by Boyden 1840.

**Hooks and Cods.** Two parties, people and nobles, in the Netherlands in the 14th and 15th centuries. By the Hooks the big fish (the Cods) were to be kept from destroying the smaller fry.

**Hooks and Eyes.** Metallic dress fastenings used instead of buttons and stitched on out of sight; known as crochettes and loops in the 14th century.

**Hookswinging.** Hindu religious rite in honor of Siva, called Charakh Pujah, held when the sun enters Aries. Hooks depending from a lever or bar are passed through the skin over



Hookswinging.

the shoulder-blade and the devotee is then raised and swung round the pivot. Though prohibited in British India it is still practiced in the native States.

**Hoole,** JOHN, 1727–1803. English dramatist, translator of Tasso, Metastasio and Ariosto.

**Hoop.** Whalebone structure worn beneath the gown to increase its circumference. It was a development of the farthingale and differed from it only in its constantly increasing size toward the ground, where it was very much larger than at the hips. It lasted till George IV. banished it from court. The fashion was revived in U. S. ab. 1850 to 1870, whalebone, reed, and finally steel hoops being worn. See FARTHINGALE.

**Hoop.** Clew to the significance of the common child's game of rolling a hoop, practiced in Europe, America and Japan, is found in the HOOP AND POLE (q.v.) game of the American Indians.

**Hoop and Pole.** Almost universal game among the N. American aborigines, played with a ring or hoop which is rolled along the ground, and long poles or lances, with which the players endeavor to transfix it. Among the Apaches the circumference of the hoop is marked, and the count depends upon the division within which the pole rests. The Blackfeet play a similar game with war arrows.

**Hooper,** JOHN, 1495–1555. Bp. of Gloucester 1550 and of Worcester 1552; burned at a slow fire after 17 months in prison. He was among the earliest of English reformers and the saintliest of Marian martyrs.

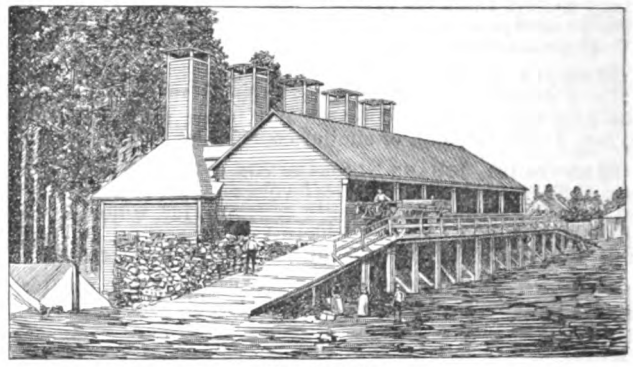
**Hooper,** MRS. LUCY HAMILTON (JONES), 1835–1893. American poet and journalist, long resident in Paris. *Under the Tricolor*, 1880.

**Hooper,** SAMUEL, 1808–1875. Boston merchant and financier, M.C. from 1860; prominently connected with the national loans and banking system; founder of the Harvard School of Mines, 1866.

**Hooper,** WILLIAM, 1742–1790. M. C. from N. C. 1774–77; signer of the Declaration of Independence.

**Hoosac Tunnel.** Longest in the U. S.: under the Hoosac Mt., Berkshire co., Mass., length 4¾ m.; constructed 1856–72 at a cost of $10,000,000. Ventilation is secured by a shaft 1,028 ft. deep, a working shaft during construction. The tunnel is used by the Fitchburg R.R.: it is double tracked.

**Hop.** *Humulus lupulus.* Vine of the Nettle family, native of the n. hemisphere, extensively cultivated for its pistillate flower-clusters, which when ripe form the hops of commerce. Hop culture is largely developed as a local industry in only a few places in the U. S. Propagation is by root cuttings, and good, strong, well-cultivated land is essential. The sets are planted in hills about six feet apart each way; each hill is furnished with a pole or poles. Twine is also extensively used as a support for the vines. The ground is kept free from weeds. In September the poles are taken down, suspended over boxes, and the hops stripped off. They are then dried in houses by artificial heat, bleached with sulphur, and baled for market. The yards are sometimes seriously affected by the attacks of the hop louse. N. Y., Wis., Ore., Cal. and Wash. are the chief



Hop House.

producing States. The crop in 1890 was 39,000,000 lbs. The exports in 1893 amounted to $4,000,000.

**Hope,** ANTHONY. See HAWKINS, A. H.

**Hope,** SIR JAMES, R.N., 1808–1881. Admiral 1870; prominent in China 1860.

**Hope,** THOMAS, ab.1772–1831. English author and traveler. His writings on *Furniture*, 1805, *Costumes*, 1809–12, and *Architecture*, 1835, had weight; his Oriental novel, *Anastasius*, 1819, is a semi-classic.—His son, ALEXANDER JAMES BERESFORD, D.C.L., LL.D., 1820–1887, M.P. 1841–52, 1857–59, 1865, and 1868–87, wrote two novels and much on ch. affairs.

**Hope College.** Founded by the Reformed Ch., 1865, at Holland, Mich. It grew out of an Academy organized 1857. It has (1895) 9 instructors and 69 students. The theological dept. has 22 students.

**Hopfen,** HANS, b. 1835. Bavarian novelist and poet.

**Hop Hornbeam.** *Ostrya virginiana.* Small tree with ripened flower-clusters much resembling hops; of the natural family *Betulaceæ;* native of N. America; known also as Iron Wood and Lever Wood.

**Hophra.** See PHARAOH HOPHRA.

**Hopkins,** JOHN HENRY, D.D., LL.D., D.C.L., 1792–1868, b. in Ireland. P. E. bp. of Vermont 1832. *View of Slavery*, 1864; *Law of Ritualism*, 1866. His *Life* was pub. 1868 by his son and namesake, S.T.D., 1820–1891, ed. *Ch. Journal*, N. Y., 1853–68. *Carols*, etc., 1862–82; *Poems*, 1883.

**Hopkins,** JOHNS, 1795–1873. Merchant of Baltimore, founder, by gift and bequest, of the Johns Hopkins Univ., a hospital, and an orphan asylum, involving ab. $8,000,000.

**Hopkins,** MARK, D.D., LL.D., 1802–1887. Prof. Williams Coll. 1830, pres. 1836–72; pres. A.B.C.F.M. 1857–87. *Evidences*, 1846; *Moral Science*, 1862; *Law of Love*, 1869.

**Hopkins,** MATTHEW, 1600–1647. English fanatic who assumed the title of Witch-finder General and traveled through the e. counties, in one year bringing 60 poor creatures to the stake. Finally, accused as a wizard by the enraged mob who applied his own favorite test, he proved his innocence by sinking and drowning. The cut shows two witches confessing their imps and familiars.

**Hopkins,** SAMUEL, D.D., 1721–1803. New England divine, founder of the influential school of Hopkinsians. *System of Doctrines*, 1793.

**Hopkins,** STEPHEN, 1707–1785. Chief-justice of R. I. 1751–54; repeatedly Gov.; in Congress 1774–78; signer of the Declaration of Independence.

**Hopkins,** WILLIAM, LL.D., F.R.S., 1794–1866. English mathematician, who, taking up the study of geology, was the first to attempt to place the physical portion on a firmer basis and to support its theories upon clear mathematical demonstrations. One of his earliest inquiries was on the effects which an elevatory force from below would produce upon a portion of

the earth's crust; another on the varying effect of the sun's and the moon's attraction according as the earth be supposed to be solid or to be formed of a fluid interior surrounded by a rigid shell.

**Hopkinsianism.** New England modification of Calvinism, still more austere, but insisting more strenuously on natural ability. See HOPKINS, SAMUEL, D.D.

**Hopkinson,** FRANCIS, 1737-1791. Congressman from N. J. 1776–77; signer of the Declaration of Independence; Judge of Admiralty in Pa. 1779–89; author of *The Battle of the Kegs* and other pieces in verse and prose, collected 1792.—His son, JOSEPH, 1770–1842, M.C. 1815–17, U. S. Judge for e. district of Pa. from 1828, wrote in 1798 the national song *Hail Columbia.*

**Hopkinson,** JOHN, F.R.S., b. 1849. English electrician.

**Hopper.** Box in the form of an inverted pyramid, devised by Rittinger for use in one of the processes of ore-dressing.

**Hopper,** ISAAC TATEM, 1771–1852. American Quaker philanthropist.

**Hoppe-Seyler,** FELIX, b. 1825. Prof. Tubingen 1861 and Strassburg 1872; writer on chemistry and physiology.

**Hoppin,** AUGUSTUS, b. 1828. American artist and illustrator.—His cousin, JAMES MASON, D.D., b. 1820, prof. Yale since 1861, has pub. *Old England*, 1867, *Homiletics*, 1881, and *Essays on Art*, 1892.

**Hoppner,** JOHN, R.A., 1759–1810. English portrait painter.

**Hop Scotch.** Child's game, in which the players in turn drive a pebble through a diagram marked on the ground, by hopping in various ways. The divisions of the diagram, which varies in different countries, are usually numbered, and the last one commonly receives a name, as Paradise in France and Germany and Temple in Austria. The game is of high antiquity; its origin is unknown.

**Hop Tree.** *Ptelea trifoliata.* Large shrub of the Rue family, bearing ill-smelling flowers and bitter winged fruits; used as a substitute for hops; known also as Shrubby Trefoil.

**Hor.** Mountain s. of Dead Sea and nearly 6,000 ft. above it, up which Aaron went to die. It is a steep and irregular trun-

Mount Hor.

cated cone, having three peaks on the n., in the loftiest of which is a grotto, the reputed tomb of Aaron. Altitude 4,360 ft.

**Horace,** or QUINTUS HORATIUS FLACCUS, 65–8 B.C. Latin poet, b. at Venusia, taken to Rome by his father, a freedman, who gave him the best advantages. Ab. 47 B.C. he went to Athens to complete his education, and was induced to join the army of Brutus at Philippi, but was pardoned by Augustus and returned to Rome. Here he became an intimate friend of the all-powerful Mæcenas, who gave him a farm in the Sabine country, which sufficed for his needs. Horace adapted the varieties of the Greek versification to the Latin language, and composed four books of odes, one of epodes, two each of satires and metrical epistles, with the *Ars Poetica.* The sound common sense, wise moderation, and beautiful flow of these poems have caused them to retain great popularity, and stamp his type of genius as cosmopolitan. The *Carmen Sæculare* in the fourth book of the odes was composed for the great Secular Feast instituted by Augustus, a fact attested by an inscription recently discovered.

**Horapollon,** 4th century. Greek of Alexandria and Constantinople, commentator on Homer and Sophocles. *Hieroglyphica.*

**Horatii.** Three Roman brothers from Rome who fought with three Curiatii (brothers) from Alba, to decide which city was to have the supremacy. Two fell, but the third, by pretending to fly, divided and slew his opponents. On entering Rome he met his sister, wild with grief at the loss of her lover, one of the Curiatii, and slew her in his wrath.

**Horeb.** Mt. Sinai, or the range of which Sinai is part.

**Horehound.** *Marrubium vulgare.* Officinal herb of the Mint family, native of Europe, introduced as a weed and by cultivation into N. America.

**Horehound,** FETID. *Ballota nigra.* Coarse herb of the Mint family, native of Europe, introduced into N. America; also known as Black Horehound.

**Horehound,** WATER. Gypsy wort; herb of the genus *Lycopus*, of the Mint family, native of swampy places in the n. temperate zone.

**Horicon.** See GEORGE, LAKE.

**Horizon.** The sensible horizon is the great circle formed by the intersection with the celestial sphere of a plane passing through the eye of the observer perpendicular to a plumb line. The rational horizon is the great circle formed by a plane passing through the earth's center and parallel to the plane of the sensible horizon.

**Horizon.** In Geology, particular place that each stratum holds in a vertical arrangement of the formations.

**Horizontal.** In the plane of the horizon, or parallel to it. At any point on the earth's surface a plane or line is said to be horizontal when it is perpendicular to a radius drawn through that point.

Common Horehound (*Marrubium vulgare*).

**Horizontal Component.** Component of the earth's magnetic intensity resolved in a horizontal plane. It is equal to the total intensity multiplied by the cosine of the dip. This element is usually denoted by *H*, and is the most important of the magnetic constants.

**Horizontal Projection.** That upon a horizontal plane of projection. Of a point, it is the foot of a perpendicular from the point to the horizontal plane; of a line, the intersection of the horizontal plane with the cylinder embracing the given line and having the elements at right angles to the plane of projection; of a surface, the section made by the horizontal plane of projection with a cylinder perpendicular to the plane and enveloping the given surface.

**Hormayr,** JOSEPH, BARON VON, 1782–1848. Tyrolese historian, Austrian and Bavarian official. *Das Land Tirol*, 1845.

**Hormogones.** Specialized portions of the filaments of certain *Cyanophyceæ*, which become detached and develop into new filaments, propagating the species.

**Hormuz.** Plain in Persia, where the Parthians were defeated by the Persian Artaxerxes and Artabanus slain 226.

**Horn,** or **Hoorne,** PHILIPPE, COUNT OF, 1522–1568. Dutch noble, who bore part at St. Quentin and Gravelines, and in the early opposition to Philip's II.'s tyranny; with EGMONT (q.v.) beheaded at Brussels by Alva's order.

**Horn,** CAPE. See CAPE HORN.

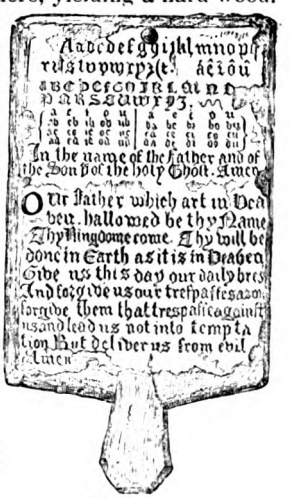
**Hornbeam.** Trees of the genus Carpinus, natural family *Betulaceæ*, natives of the n. hemisphere, yielding a hard wood. *C. caroliniana*, the e. N. American species, is known also as Iron Wood, Blue Beech, and Water Beech.

**Hornbill.** See LEVIROSTRES and CUCULI.

**Hornblende.** Dark colored, usually black or greenish-black, anhydrous, magnesium, iron, and aluminium metasilicate, classed as a variety of amphibole. It is common as a rock constituent, sometimes forming the principal mass of a rock, as in hornblende-schist, and also frequently associated with quartz and feldspar in crystalline eruptive and metamorphic rocks.

**Hornbook.** Primer, usually a framed leaflet, used in England from the Middle Ages to ab. 1750.

**Horncard.** Form of DROMOSCOPE (q.v.) devised by Piddington.



Hornbook.

**Horne,** GEORGE, D.D., 1730–1792. Dean of Canterbury 1781, Bp. of Norwich 1790. *Commentary on the Psalms*, 1776.

**Horne,** RICHARD HENGIST, 1803–1884. English poet and dramatist, long in Australia. His epic, *Orion*, 1843, was published at a farthing.

**Horne,** THOS. HARTWELL, D.D., 1780–1862. Anglican divine, librarian in Surrey Inst. 1809 and British Museum 1824–60. His *Introduction to the Scriptures*, 5 vols., 1818–46, has been widely used.

**Horned Toad.** Lizard, genus *Phrynosoma*, whose body is plump like a toad's; its skin is covered by scales, some of which are strongly spined. It lives west of the Mississippi, is

Horned Toad (*Phrynosoma cornutum*).

gentle, easily tamed, lives on flies and ants, and mimics the color of the ground, but not rapidly, as do other Lizards. The female bears seven young at a time.

**Hornellsville.** City of Steuben co., N. Y., incorporated 1888. Pop., 1890, 10,996.

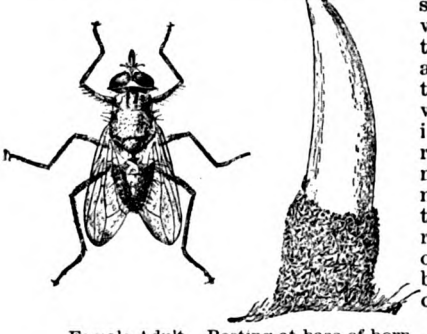
**Horner,** FRANCIS, 1778–1817. M.P. 1806; noted as an economist. *Memoir*, 1843.

**Horner,** WILLIAM GEORGE, 1786–1837. English mathematician. *Natural Magic*, 1832. See HORNER'S METHOD OF APPROXIMATION.

**Horner's Method of Approximation.** Pub. 1819. It determines approximately the incommensurable real roots of $f(x)=0$ when the first figure of the root is known. Derived equations are formed, having roots less by a given number than those of the preceding equation. From each derived equation an additional figure is found.

**Hornet.** *Vespa maculata.* Insect of the Wasp family, building a nest of material gathered from leaves and wood resembling paper of a gray color. The name is applied to several varieties. Its sting is severe and painful. See VESPIDÆ.

**Horn Fly.** *Hæmatobia serrata.* Smaller than the house fly, and annoying to cattle, sucking their blood while collecting about the bases of the horns and other places where they are not easily warded off. While sucking, they inject an irritating fluid, which makes the blood flow more freely. To keep the flies off, the hair is rubbed daily with fish oil, 2 qts., crude carbolic acid, 3 oz., and oil of tar, 1 oz.



Female Adult. Resting at base of horn.

**Hornpipe.** Old English dance originally played in $\frac{3}{2}$ time, but now in common time: it is a favorite with sailors.

**Horn Silver.** AgCl. Mineral occurring in soft, wax-like masses, and usually confined to the upper portion of a deposit, or the parts to which saline waters have had access. See CERARGYRITE.

**Hornstone.** $SiO_2$. Splintery variety of quartz, resembling flint.

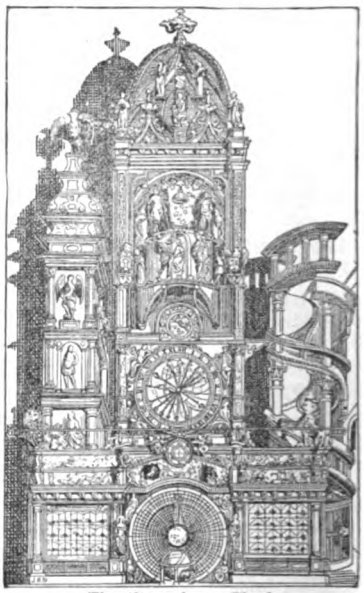
**Hornung,** ERNEST WILLIAM, b. . Anglo-Australian novelist. *A Bride from the Bush*, 1889; *Unbidden Guest*, 1894; *Irralie's Bushranger*, 1896.

**Hornwort.** *Ceratophyllum demersum.* Insignificant aquatic plant of the natural family *Ceratophyllaceæ*, native of the n. hemisphere.

**Horograph.** Curve traced upon the surface of a sphere of unit radius in obtaining the integral curvature of a portion of any curved surface. The radius so moves as to become successively parallel to all the normals that can be erected at the boundary of the given surface. The area inclosed is called the curvature integra of the given surface.

**Horological.** Flowers with a definite daily period of unfolding or closing.

**Horology.** Science dealing with contrivances for marking the hours. The earliest of these was the sun-dial (see DIALS). Another method was the emptying of a vessel of sand or water (see CLEPSYDRA, HOUR-GLASS). Alfred the Great measured time by the consuming of candles. Pope Sylvester II. is said to have invented the scapement 996, in a clock he made for Magdeburg, and many European monasteries had wheel-and-weight clocks in the 11th century. Richard de Wallingford made a famous astronomical clock at St. Alban's 1320, and the great one at Strassburg was constructed 1352–70 and remodeled 1571–74. Portable clocks with mainsprings were already known in 1320 and repeaters ab. 1676.



The Strassburg Clock.

**Horopter.** Line connecting those points in the visual field which in any given position of the eyes form their images on corresponding points of the two retinæ, and are consequently seen as single.

**Horoscope.** Observation of the aspect of the heavens at the moment of a person's birth; by it astrologers claimed to predict the future events of his life.—Also, a diagram of the twelve houses, or signs of the zodiac, employed in such prediction. See ZODIAC.

**Horrocks,** JEREMIAH, 1619–1641. English Astronomer, first to observe the transit of Venus 1639. *Venus in Sole visa*, 1662, tr. 1859; *Opera*, 1678.

**Horse.** Draft and speed are the two things required of horses. The former demands strength and weight combined, the latter the greatest possible amount of power to move the limbs with the least possible weight; therefore the breeds of horses have developed in these two lines, and are treated of under their respective names. The young of both sexes is a foal. A male foal is a colt, a female a filly. The adult male is a stallion, or, when castrated, a gelding. The adult female is a mare. See EQUIDÆ and EQUUS.

AMERICAN TROTTING HORSE.—Strictly speaking there is no single breed of trotters, though trotting horses transmit their peculiar style of gait as readily and with as much certainty as other characteristics are transmitted in other breeds and races of domestic animals. The trotting horse has been evolved from the thoroughbred race-horse of England, and most of them carry more or less running blood. Various famous individuals, as Imp. Messenger, Justin Morgan, Daniel Lambert, Henry Clay, and Rysdyck's Hambletonian, have given their names to their descendants, but none of them can be said to exist as breeds.

CLEVELAND BAY.—Breed imported from England, characterized by medium to large size and extremely lively style and action. They are largely used as coach horses: the favorite and almost universal color is dark bay.

CLYDESDALE.—Breed of draft horses imported from Scotland. They are large and powerful, but in general not inclined to rapid action. In color they are mostly bay or brown, though black, sorrel, roan, and gray are often met with.

ENGLISH SHIRE, or CART HORSE.—He resembles very closely the Clydesdale, and is no doubt related to it. These are apt to be of smoother form and quicker action, and rather more inclined to be ill-tempered. The colors are the same as the Clydesdales.

FRENCH COACH.—Breed smaller and with more life, speed, and conformation of the trotting horse than the Percheron.

They have been produced by the use of thoroughbred sires from England upon the common mares of the country.

FRENCH DRAFT.—Breed distinguished from the Percheron only by stud-book limitations as to locality whence imported and forms of registration in France.

ORLOFF.—Breed that originated in Russia by crossing the native blood with the Arabian. They are trotters with a graceful and spirited carriage, and make fine coach horses. They are almost unknown in America.

PERCHERON.—Breed of draft horses, mainly imported from the district of La Perche in France. They are of large size,

Percheron.

upright carriage, quick action, especially at a walk, and generally good dispositions. In color they are mostly blacks and grays.

PONY.—Technically a horse under fourteen hands in height. The descendants of the horses brought to America by the Spaniards have run wild on the Western plains, and have given rise to a race of small, tough, wiry horses, very useful for saddle purposes, and generally known as ponies. Locally they are also known as bronchos, mustangs, and cayuses. The

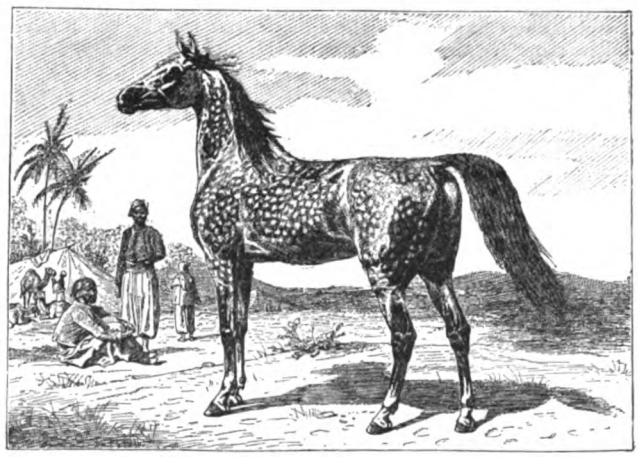
Shetland Pony.

small horses found in some of the bleaker parts of the British Isles are imported mostly as semi-pets for ladies and children; this business is assuming quite large proportions. The kinds usually brought are the Shetland, from the Shetland Islands, the Black Welsh, from the mountains of Wales, and the Exmoor.

STANDARD BRED.—American trotting horse that is eligible to record or is recorded in the stud-book either under the rules of performance or descent.

SUFFOLK PUNCH.—Draft horse much thought of in England but seldom imported: smaller and more compact than the Clyde and Shire, and also more active; almost uniformly sorrel in color.

THOROUGHBRED.—English running horse descended from the Arabian, Barb, and Turkish horses imported into England ab.



Arabian.

1670. They are fleeter and possessed of more courage and endurance than any other known breed of horses.

**Horse,** FOSSIL. See HIPPARION.

**Horse,** MASTER OF THE. Officer of the Queen of England's Household, who has entire charge of the royal stables and employees and the expenditures. He rides next to the monarch, and holds office under the party in power; salary, £2,500 per annum.

**Horse.** Rope reaching from the middle to the extremities of a yard, used for sailors to stand on when loosing, reefing or furling a sail.—Also, mass of country rock lying in a mineral deposit and surrounded by ore and vein stone.

**Horseback.** Swell or ridge of a clayey character in the floor of a coal mine, cutting out the coal. Compare HOGBACK.

**Horse-Balm.** Plants of the genus *Collinsonia;* coarse herbs of the Mint family, native of e. N. America. *C. canadensis*, the n. species, is known also as Richweed and Stoneroot.

**Horse-Chestnut.** See ÆSCULUS HIPPOCASTANUM.

**Horse-Flesh Ore.** See BORNITE.

**Horse Guards.** 1. Official residence in Parliament Street, London, till 1871, of the Commander-in-chief of the British army, since removed to the War Office. It contained the offices of all the headquarter staff of the army, and is still used by some of the officers and clerks of the Headquarter Army Department. 2. The third heavy cavalry regiment of the Household Brigade and known as the Oxford Blues, raised in 1661.

**Horse Latitudes.** Portions of the ocean where strong gales and high seas prevail. The story that in these regions navigators formerly threw overboard their horses or other live stock is probably a myth.

**Horse-Mint.** Plants of the genus *Monarda;* coarse showy-flowered herbs of the Mint family, natives of N. America.

**Horse-Nettle.** *Solanum carolinense.* Coarse spiny-leaved herb of the Potato family, native of the s.e. U. S.

**Horse-Power.** Unit of work, used to measure the performance of motors. When steam engines replaced animal power for hoisting and pumping at mines, it became desirable to state the capacity of the engine in terms of the power which it replaced. James Watt found by experiment with large and powerful roadsters that they could do a work in lifting or hauling which was equivalent to lifting 33,000 lbs. one foot high in one minute. This amount of work is known as a horse-power, in whatever way the factors of feet and pounds are made to vary, provided only the product and the time are constant. A horse could not work at this rate continuously for ten hours, but for a short time only (see ANIMAL STRENGTH). The French unit, force de cheval or cheval vapeur, is 4,500 kilogrammeters (= 32,549 foot pounds) and is the metric equivalent of the usual unit.

**Horse Racing.** Although chariot racing was one of the ancient Greek games, horses were not raced under saddle till the 33d Olympiad. In England the sport has always been popular with all classes since the tenth century, and several kings have tried to improve the breed of race-horses. The Chester races were established 1571 and in the reign of James I. York,

Garterly, Corydon, and Newmarket were already famous courses. The prize was a silver bell. Under Charles I. races were held at Epsom 1638 and in Hyde Park, and these were patronized by Charles II., who substituted for the bell a silver bowl worth 100 guineas. William III. and Anne added to the

Horse Racing at Newmarket 1789, by Rowlandson.

various plates. Arab blood was imported in the Byerly Turk ab. 1695, the Darley Arabian ab. 1700, and the Godolphin Arabian (1724–1753), and to one of these three every modern racehorse traces its ancestry. The first racing calendar was published 1727 and the Jockey Club founded 1750. Courses were established at Ascot 1727, Doncaster 1776, and Goodwood 1802. In U. S. horse racing began in colonial times, and is now practiced throughout the country. The highest records of speed for one mile against time in U. S. are: running, Salvator 1.35½, 1890; trotting, Alix 2.03¾, 1894; pacing, Robert J. 2.01½, 1894; pacing with running mate, Flying Jib 1.58¼, 1894; team, Belle Hamlin and Justine 2.12¼, 1892. See DERBY DAY and HORSE.

**Horseradish.** *Roripa armoracia.* Large-leaved and deep-rooted herb of the Mustard family, native of Europe, introduced by cultivation into N. America.

**Horseshoe Crab,** or HORSEFOOT CRAB. See POECILOPODA.

**Horseshoeing.** Modern demands for speed and heavy work in connection with asphalt and macadamized roads have made horseshoeing a necessity. The shoe, however, must be made to fit the foot; the reverse process should never be tried. They should be removed once a month and the protected parts cut, but the rest of the foot should never feel the knife. Inventions to do away with horseshoe nails have not yet been proved practical. Horseshoes are now made by machinery.

**Horse-Sugar.** See SWEET-LEAF.

**Horsetail Rushes,** or HORSETAILS. Plants of the class EQUISETACEÆ (q.v.).

**Horseweed.** *Erigeron canadense.* Tall, white-flowered herb of the Composite family, native of N. America, and common as a weed; introduced into Europe.

**Horsford,** EBEN NORTON, M.D., 1818–1893. Chemist; prof. Harvard 1847–63: then manufacturer, especially of acid phosphates.

**Horsley,** JOHN CALLCOTT, b. 1816. English painter, R.A. 1865.

**Horsley,** SAMUEL, D.D., LL.D., F.R.S., 1733–1806. Bp. of St. David's 1788, Rochester 1793, St. Asaph's 1802. He had a controversy with Dr. Priestley, edited Sir I. Newton's Works 1785, and tr. Hosea and the Psalms. *Theol. Works*, 9 v., 1830.

**Horsley,** WILLIAM, 1774–1859. Organist in London; composer of many glees.—His son, CHARLES EDWARD, 1822–1876, produced oratorios, anthems, and cantatas.

**Hort,** FENTON JOHN ANTHONY, D.D., LL.D., b. 1828. Divinity prof. at Cambridge 1878; N. T. reviser; ed., with Bp. Westcott, Greek N. T., 1881.

**Hortense,** QUEEN (EUGÉNIE DE BEAUHARNAIS), 1783–1837. Daughter of Josephine; wife of Louis Bonaparte 1802.

**Hortensius,** QUINTUS, 114–50 B.C. Roman orator, consul 69 B.C. He had no rival in the forum till he encountered Cicero. His eloquence was of a florid cast, his action elaborate, and his memory wonderfully quick and retentive.

**Horticulture.** Men cultivated gardens or small inclosed spaces near their houses long before they entered upon general agriculture. Homer speaks of the gardens planted by Alcinous and Laerte where they wished to gather everything charming to sight and taste. The Gauls and the Celts perfected their horticultural methods under Roman dominion. The art took refuge after the barbarian invasions in the cloisters, but from the Renaissance it took a fresh start, especially in France. In Paris the JARDIN DES PLANTES (q.v.) has done work of the first order. Belgium, England, Germany, Italy, and America rank high in horticulture, and with increase of wealth will attain constantly better methods and results. See FLORICULTURE, LANDSCAPE GARDENING, and POMOLOGY.

**Horton,** SAMUEL DANA, b. 1844. American writer on finance. *Silver and Gold*, 1876; *The Pound and the Guinea*, 1887; *Silver in Europe*, 1890–92.

**Horuk.** See BARBAROSSA.

**Horus.** Hawk-headed Egyptian divinity, son of Osiris; answering in part to the sun-god Ra; identified by the Greeks

Horus (Louvre).

Horus.

with Apollo. Confounded with Harpocrates, the Younger Horus, and with the Elder Horus, called Haroeris.

**Horvath,** ISTVAN, 1784–1846. Hungarian historian. *Primitive Hungarian Families*, 1820; *Sketches*, 1825.

**Horvath,** MIHALY, 1809–1878. Prof. Vienna 1844, Bp. of Csanad 1848; exiled 1849–67. *History of Hungary*, 8 vols., 1842–46.

**Hosack,** DAVID, M.D., LL.D., 1769–1835. Prof. Columbia Coll., 1797–1807; Prof. Coll. Physicians and Surgeons 1807–30. *Botany*, 1795; *Hortus Elginensis*, 1801–11; *Nosology*, 1829.

**Hosanna.** Expression of Jewish and Christian praise.

**Hosea.** Jewish prophet, ab. 725 B.C.; author of 28th O. T. book.

**Hose.** Originally the male nether garments as a whole. Stockings as a separate article of dress were appended to the large breeches of the 16th century; before that they were all in one. The enormous Elizabethan trunk-hose were stuffed with bran and wool in emulation of the women's farthingales.

**Hosein,** or HUSAIN. Second son of Ali and Fatima, daughter of Mohammed. His death at the hands of his rivals is regarded by the Sheahs as of atoning efficacy.

**Hoshea.** Last king of Israel, killed, or carried, with many of his people, into captivity in Assyria, on the fall of his capital, Samaria, ab. 720 B.C.

**Hosiery.** Stockings and all knitted goods. Knitting was invented in the 15th century, probably by the Scotch, by whom it was introduced into France. The knitting-frame was invented by William Lee in 1859, and improvements were made by Strutt (1758), Brunel (1816), Claussen (1844), Townsend (1858), Cotten (1860). Gist and Reid were two Americans who also helped to improve knitting machinery. The chief seats of the industry in England are Nottingham and Leicester. France, Germany, and the U. S. engage extensively in the hosiery business.

**Hosius,** ab. 257–359. Bp. of Cordova, Spain; pres. Council of Nice 325; influential with Constantine, but persecuted by the Arian Constantius.

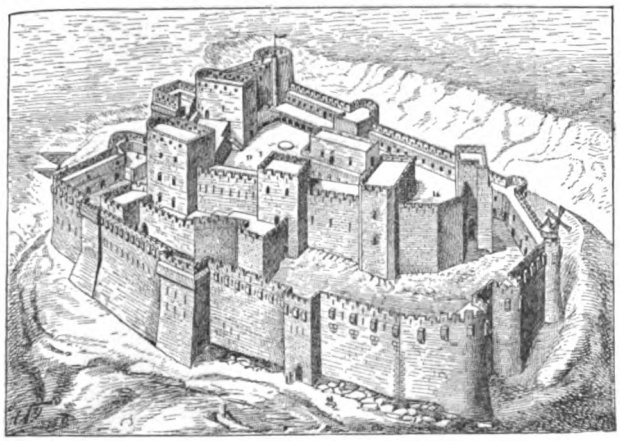
**Hosmer,** HARRIET, b. 1830 in Mass. Sculptor, pupil of Gibson at Rome. Her *Beatrice Cenci* is in the Mercantile Library, St. Louis. Many replicas exist of her statue of *Puck*. *Zenobia* is her masterpiece.

**Hosmer,** JAMES KENDALL, b. 1834. Prof. Washington Univ., St. Louis, 1874; biographer of Samuel Adams, 1884, and Sir H. Vane, 1888. *The Color Guard*, 1864; *Story of the Jews*, 1886.

**Hospices.** Houses to shelter travelers, especially in the Alps. That on the pass of Great St. Bernard was founded 962.

**Hospinian,** RUDOLPH, 1547–1626. Swiss reformed divine and polemic writer. His *Concordia Discors*, 1609, was answered by Hutter for the Lutherans, and *Historia Jesuitica*, 1619, tr. 1678, by Bellarmine.

**Hospitalers.** Knights, laymen, and monks, joined from the 9th century in various orders for nursing, protecting pilgrims from the sea to the Holy City, and other pious works;



Fortress of the Hospitalers (restored).

especially the Knights of St. John of Jerusalem. Their great stronghold, of which there are still considerable remains, lay inland from Tripoli, Syria. The Hospital Sisters date from the 12th century. See ST. JOHN.

**Hospitals.** Private charity and universal hospitality rendered refuges for the indigent and infirm unknown till ab. 350. Fabiola, a Roman lady, is said to have set the example, and under St. Jerome they were established in Palestine. Soon afterward the Byzantine hospitals are quoted as models, and as Christianity spread early councils directed that from one-quarter to two-thirds of the revenues of the churches should be applied to works of relief and hospitality. In France the first hospital was founded by Childebert at Lyons 542, and others were opened at Rheims and Autun soon afterward. The Arabs established a magnificent hospital at Cordova, Rome possessed five in the 8th century, and the Hotel Dieu of Paris was founded 7th century. During the next 200 years the introduction of leprosy from the Crusades and St. Anthony's Fire necessitated special pest-houses, and 19,000 arose throughout Christendom. The change of the early Hospitalers into military orders turned these refuges to vile use. The funds were misappropriated, corruption and abuses of all kinds crept in, despite the thunders of the Church, and the houses fell into decay till reform was seriously taken in hand in the 16th century. In 1579 a royal decree in France forbade any one to be on the governing boards who was a noble, archer, public officer, ecclesiastic, or any of their servants or nominees, and after the hospitals were secularized their advance in efficiency was constant. In England the most famous are St. Bartholomew's, founded 1102, St. Thomas's 1213, Bethlehem, or Bedlam, 1547, Guy's 1721, Westminster 1719, and London 1740. In the U. S. among the older institutions are Pa., Phila. 1751, N.Y. 1771, and Mass., Boston 1811. Johns Hopkins, Baltimore, St. Luke's, N.Y., and Roosevelt, N.Y., are of later origin.

**Hospitals,** MILITARY. In the U. S. Service there is a hospital at every military post, under the supervision of a medical officer. Field hospitals are temporary establishments in the vicinity of the field of battle for the immediate treatment of the wounded. General hospitals are located in more secure positions, with better appliances and administration.

**Hospitium.** Ancient nations practiced hospitality in a degree, as under the sanction of the gods. Sometimes a treaty of hospitality was made by the State, sometimes by individuals. In Rome such private agreements were displayed upon the walls of the house in the principal room. The Greek State appointed an official, called the Proxenus, to take charge of strangers coming from a State on terms of hospitality with it.

**Hospodar.** Title of the Governors of Moldavia and Wallachia till united 1861 as Roumania.

**Host.** In Botany and Mycology, plant which supports another as a parasite; in Zoology, animal inhabited by a parasite.

**Host.** In R. C. Ch., eucharistic wafer of unleavened bread, elevated for the reverence of the faithful as Christ's body.

**Höst,** JENS KRAGH, 1772–1844. Danish author. *Count Struensee*, 1824; *Gustavus Adolphus*, 1808; *Christian VII.*, 1810.

**Hostage.** Person given by his own State to another as pledge for the fulfillment of a treaty. The custom existed from antiquity, but has long been obsolete.

**Hostilius,** TULLUS. Third alleged King of Rome 670–638 B.C.

**Hostius,** ab. 120 B.C. Latin epic poet, known by a few fragments.

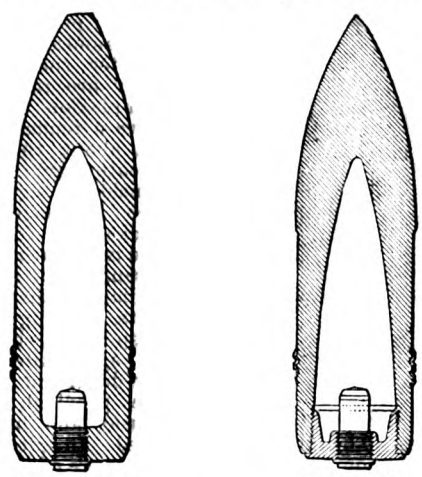
**Hostrup,** JENS CHRISTIAN, 1818–1893. Danish dramatist and poet.

**Hot-air Engine.** See CALORIC ENGINE.

**Hotbed.** Frame, covered with glass or cloth, to retain heat resulting from the decomposition of animal or vegetable matter, for the purpose of cultivating plants out of season.

**Hotchkiss Guns.** Inventions of Benjamin B. Hotchkiss, an American mechanician and artillerist. They include a magazine small-arm, a revolving cannon, rapid-fire guns of various calibers, and breech-loading guns for mountain service. The 2-pounder and 12-pounder mountain breech-loading rifles have been adopted in the U. S. service. These guns are capable of being transported on mule back or by traction wherever troops can go in a mountainous country.

**Hotchkiss Projectiles.** The projectile and charge are combined in a metallic cartridge. For the 12-pounder breech-loading rifled mountain gun there are three projectiles; viz., the shell, shrapnel, and canister. Each has in the base a center hole to fire the cartridge and five igniting holes to communicate fire to the charge. The common shell is of cast-iron of cylindro-ogival pattern, with copper rotating band and point percussion fuse. It contains a bursting charge of 6.3 ounces of



Common Shell. Steel Shell.

fine-grained powder. The shrapnel is made of cast-iron and loaded with 160 hardened lead balls imbedded in a sulphur matrix: a center ignition tube connects the point-combination fuze at the head with a bursting charge at the base. The canister consists of a thin brass envelope with 6 wrought-iron segmental linings and contains 125 hardened lead balls. For the service of the 2-pounder gun but two types of projectiles are used, canister and shell, the former containing 30 hardened lead 1-oz. bullets.

**Hotchpot.** Mingling of lands and chattels of a deceased person in a common fund for distribution. It generally comes into operation under statutes of distribution, where one or more of the children have received advancements from the deceased parent beyond the others.

**Hotel.** In the U. S., generally synonymous with inn; in England, under certain statutes, it has been defined by the courts as a lodging-house where board is also supplied.

**Hôtel des Invalides.** Paris. Founded by Louis XIV. for disabled and infirm soldiers; built 1671–75. The building is of three stories, 650 ft. long, while the gilded lantern is 344 ft. above the ground. It is adorned with military trophies, statues, paintings, etc. The red granite sarcophagus of Napoleon I. lies beneath the dôme.

**Hotman,** FRANÇOIS, 1524–1590. Huguenot lecturer on law. *Franco-Gallia*, 1573.

**Hot Shot.** In the days of wooden ships and smooth-bore

ordnance, furnaces were provided in sea-coast works to make shot red-hot. These, fired with lower velocities than usual, would splinter the wooden sides of vessels on penetrating their hulls and set them on fire. They are now practically obsolete.

**Hot Springs.** Capital of Garland co., Ark., 55 m. s.w. of Little Rock; resort for invalids. The 72 springs vary from 95° to 150° F. Pop., 1890, 8,086.

**Hotspur.** See PERCY.

**Hottentots.** Negroes of w. S. Africa, now a remnant of a once more extended race. Between the attacks of the Kafirs

Hottentots.

on the n. and the Dutch on the s. they have been so reduced that their disappearance as a pure race will soon occur. They stand somewhat higher in the scale of civilization than their neighbors, the Bushmen, compared with whom they have narrow faces, projecting cheekbones and are taller, though shorter than the Boers. They are rather light in complexion. The women have a tendency to lay on fat about the hips, etc. (steatopygy), which they consider a sign of beauty. The language has four clicks and forty vowels, and is agglutinative. They resemble the N. American Indians in their tribal life, huts, hunting, etc. They keep herds, but practice no agriculture; worship the dead, and fear ghosts; are prodigal, lazy, love music, and have certain sacred dances. The infirm are neglected. In spite of excesses and privations, some of them attain the age of 100 years. In 1891 they numbered in Cape Colony, where they are now mingled with the Europeans, 50,388. Others live as nomads in Great Namaqualand.

Hottentots.

**Hottinger,** JOHANN HEINRICH, 1620–1667. Swiss Orientalist; prof. at Zurich and Heidelberg. *Hist. Ecclesiastica*, 9 vols., 1655–67.—His son, JOHANN JACOB, 1657–1735, prof. Zurich from 1698, pub. 4 vols. of *Swiss Ch. History*, 1708–29.—His great-grandson and namesake pub. a *Life of Zwingle*, 1842, tr. 1856.

**Hot Wave.** Phenomenon seen often on the daily weather map, by virtue of which an area of high atmospheric temperature is seen to advance steadily over the country, usually toward the n.e.

**Hot-Well.** Reservoir to which the warm water flows from the condenser of a condensing engine. In the case of jet condensers, the injection water mixed with the condensed steam is greatly in excess of the needs of the boiler. Hence the air-pump delivers its entire discharge into the hot-well, from which the feed-pump draws only what is required to make steam. The excess runs to waste. In siphon and ejector condensers the end of the descending tube is water-sealed in the hot-well to prevent air from rising to break the vacuum. In river-boat engines, the hot-well is usually an enlargement of the air-pump at the top, so that its contents will act to help the tightness of the bucket. See CONDENSING ENGINE and CONDENSER.

**Hot Winds.** Such as bring a sudden or remarkable rise in temperature. These are locally known by specific names. See FÖHN WINDS, HARMATTAN and CHINOOK WINDS.

**Hot Winds** OF KANSAS. Hot, dry, steady, s.w. winds, liable to sweep over Kansas and neighboring States and to shrivel up the standing crops. Apparently direct solar heat combines with the compression of descending air to produce this warmth and dryness.

**Houbraken,** JACOB, 1698–1790. Dutch portrait engraver. He was an admirable draughtsman; his modeling of flesh was

Dutch Interior, by Houbraken (after Vanloo).

superb, his line was firm and brilliant, and in producing textures he stands almost without a rival.

**Houdin,** ROBERT, 1805–1871. French prestidigitator, originally a mechanician; on the stage 1845–55; sent to Algeria 1856 to confute the miracle-working Marabouts with greater wonders. *Autobiography*, 1857; *Confidences*, 1859.

**Houdon,** JEAN ANTOINE, 1741–1828. French sculptor. He visited America 1785 on the invitation of Dr. Franklin, and made a statue of Washington, now in Richmond, Va. His bust of Voltaire is especially celebrated.

**Hough,** FRANKLIN BENJAMIN, M.D., 1820–1885. Writer on the history, statistics, climatology and forestry of N. Y. *Meteorology of N. Y.; Reports on Forestry*, 1878–80.

**Hough,** GEORGE WASHINGTON, b. 1836. Director of the Dudley Observatory, Albany, N. Y., 1860–74: now Prof. of Astronomy in the North Western Univ. at Evanston, Ill.; inventor of self-registering and printing barograph and thermograph.

**Houghton,** DOUGLAS, 1809–1845. Assistant to Schoolcraft in his expedition to the sources of the Mississippi 1830; first State Geologist of Mich. 1837, of which survey he made seven annual reports.

**Houghton,** HENRY OSCAR, 1823–1895. Founder of the Riverside Press at Cambridge, Mass., 1852; head of the publishing house of Houghton, Mifflin & Co. 1880.

**Houghton,** LORD. See MILNES, RICHARD M.

**Hounds.** Class of sporting dogs used to run down the quarry. The Greyhound, formerly called the Gazehound, hunts by sight, as does the Deerhound and Wolfhound. The Foxhound is the type of those that run by scent, the Harrier and Beagle being smaller forms, and all derive their scent from the Bloodhound, which in France prevails far more in many sub-varieties, St. Hubert's hounds being almost pure Bloodhounds.

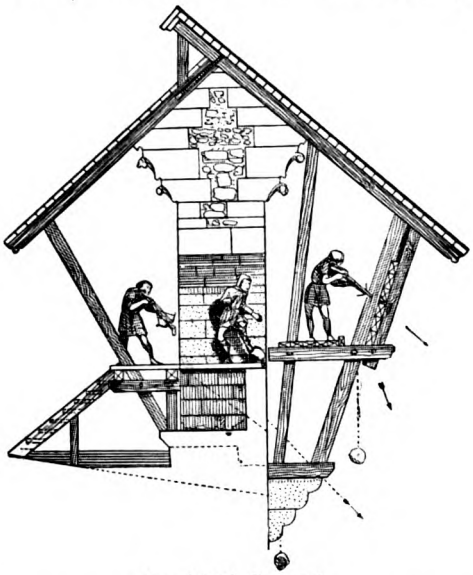
**Hound's Tongue.** *Cynoglossum officinale.* Coarse rough-leaved herb of the Borage family, native of Europe, introduced as a weed into N. America.

**Hour.** Measure of time amounting to $\frac{1}{24}$th of a mean solar day, or $\frac{1}{12}$th of the time during which the sun is above the horizon. The Romans used the latter computation, noon being the sixth hour, and their hours varied in length according to the season.

**Hour Angle** OF A STAR. Angle at the pole between the meridian and the hour circle passing through the star; or it is measured by the arc of the celestial equator, included between the s. point and the arc of a great circle drawn from the star perpendicular to the equator.

**Hour Circle** OF A STAR. Great circle of the celestial sphere, passing through the star and the n. and s. poles of the heavens.

**Hourd,** HOARD, or HOARDING. Boarding raised for protection. In the Middle Ages it was the wooden gallery breasted



Hourd (14th Century).

with stout boards thrown out from the wall to enable the garrison to protect the base of the wall. It was loopholed for archery and stones.

**Hour-Glass.** Instrument for measuring time by means of a double glass connected by a small tube, placing in one sufficient sand to occupy an hour in passing through to the other. In many old churches metal brackets used as hour-glass stands are still to be seen by the side of the pulpit for timing the sermon.

**Houris.** Beautiful maidens with bodies of pure musk and unfading attractions, reserved for the companionship of the faithful in the Mohammedan heaven.

**Hours.** In liturgical language, those times at which services are held in the R. C. Ch. There are seven: matins, comprising lauds and nocturns, prime, terce, sext, nones, vespers, and complin. Terce, sext and nones are called the Little Hours.

**Hours.** Daughters of Zeus and Themis, presiding over the seasons and aiding the fertility of the earth; represented as blooming maidens or youths, bearing the products of the seasons.

**Hours,** BOOK OF. Church service containing, besides the prayers of the Mass, various parts of the Holy Office recited or sung by the Church at particular hours of the day or night. Mediæval Hours were MSS. ornamented with paintings and borders of flowers, birds and insects of marvelous beauty. The most famous was the Hours of Anne of Brittany, a precious work of art of the late 15th century.

**Hours of Labor.** Most advanced modern governments have limited the hours for which children, young persons, and women are allowed to be occupied in factories or large workshops. Government regulation of the hours of labor for men, though a matter of much discussion, and even legislation, has not yet been practically carried out. U. S. Government require eight hours' work of their employés.

**Housatonic River.** In w. Mass. and Conn. It heads in the Berkshire Hills and flows generally s. to L. I. Sound, at Bridgeport. Drainage area 1,674 sq. m.; length 125 m.

**House,** EDWARD HOWARD, b. 1836. American journalist. Prof. Univ. Tokio 1871–73; ed. Tokio *Times*, 1877–80; writer on Japan.

**Houseboat.** Barge built up, roofed, and fitted for habitation; used as a pleasure-boat and for summer camping.

**House Drainage.** The pipes for removing wastes from a house should be trapped under each closet, basin, or fixture, in order to prevent gases from entering. They should also be connected to a ventilating pipe running to the roof. The main soil pipe should be well-jointed, and a second ventilating pipe be connected to it outside the house. The efficacy of a house drainage system may be tested by dropping a small quantity of oil of peppermint into the nearest manhole of the sewer, when, if the system be imperfect, the odor of peppermint will be soon perceived throughout the dwelling.

**Household,** ROYAL. In Great Britain it is composed of the departments of the Lord Steward, Lord Chamberlain, Master of the Horse, Mistress of the Robes (including the Bedchamber Women and MAIDS OF HONOR [q.v.]), the Royal Hunt, Chapels Royal, Royal Almonry, and Medical Department.

**Household Brigade.** British troops whose special duty is to guard the sovereign and protect the metropolis. They comprise the First and Second Life Guards and the Royal Horse Guards, and three regiments of foot, the Grenadier, Coldstream, and Scots Guards.

**House-Leek.** *Sempervivum tectorum.* Fleshy herb of the natural family *Crassulaceæ*, growing often on housetops in Europe.

**Housemaid's Knee.** Inflammation, sometimes followed by formation of pus, of the bursa above the kneecap; due to prolonged and continuous resting upon the knees.

**House of Commons.** Eastern portion of the Houses of Parliament, Westminster, devoted to the deliberations of the

Division Lobby of the House of Commons.

Commons. It is entered through Westminster Hall, a portion of the original building.

**Housing.** Covering for a horse used on state occasions. In the tournament, or in public processions, it was usually

Housing, 1280.

emblazoned with the arms of the rider, made of silk, cloth of gold, or other rich stuff.

**Houssaye,** ARSENE, 1815–1896. French novelist, dramatist, poet and critic; director Comédie Française 1849–56; ed.

*La Presse*, 1861. *Portraits of 13th Century*, 1844: *Hist. Dutch Painting*, 1846; *Hist. French Art*, 1860; *Souvenirs*, 1885.—His son, HENRI, b. 1848, historian and critic, chiefly of classical subjects, became an Academician 1894.

**Houston.** Capital of Harris co., Texas, on Buffalo bayou, 45 m. from the Gulf of Mexico, founded 1836. It has nine railroads and a considerable trade, especially in shipments of cotton. Pop., 1890, 27,557, since greatly increased.

**Houston,** DAVID CRAWFORD, U.S.A., b. 1835. Military engineer, engaged largely in harbor construction.

**Houston,** SAM, 1793–1863. Gov. of Tenn. 1827. In 1829 he abandoned his office and took up his residence among the Cherokees, who adopted him as a member of the nation. He settled in Texas 1832; commanded at the battle of San Jacinto, 1836, where the Mexican forces were overthrown; was Pres. of Texas 1836–38 and 1841–44, U. S. Senator 1845–59, and Gov. of Texas 1859–61. He opposed secession.

**Hovas.** Aborigines of interior Madagascar, numbering nearly two million. Derived from the same stock as that which peopled Polynesia; they are Malays, and their language is known as Malagassy. Since 1869, when their queen was converted, ab. one-fourth of the population has adopted Christianity and made great progress in civilization; schools and printing establishments abound. In 1879 slavery was abolished. While they are artificers in metal their architecture is primitive. In the old religion the father of the family was the priest. They have many superstitions, *e.g.*, children born on certain unlucky days must be killed. One-fourth of the infants are thus sacrificed. They were defeated by the French 1895.

Hova Guard and Bearers.

**Hoveden,** ROGER, d. ab. 1200. English chronicler. His work, pub. 1596, extends from that of Bede, 732, to 1201.

**Hovenden,** THOMAS, 1840–1895. Irish-American genre painter, widely known through engravings of his works; killed in attempting to save a child.

**Hovering Acts.** Statutes asserting revenue jurisdiction in the enacting country over the sea, beyond a marine league from shore; not yet a part of international law.

**Hovey,** ALVAH, D.D., LL.D., b. 1820. Prof. Newton Theol. Inst., Mass., 1853, Pres. 1868. *Theology and Ethics*, 1877; *Biblical Eschatology*, 1888. He ed. a N. T. commentary, 7 vols., 1881–90.

**Hovey,** ALVIN PETERSON, 1821–1891. Brig.-gen. U. S. Vols., 1862–65; U. S. Minister to Peru 1865–70; M.C. 1887; Gov. of Indiana 1889.

**Hovey,** CHARLES MASON, 1810–1887. Ed. *Mag. of Horticulture*, 1836–69. *Fruits of America*, 1854.

**How,** WILLIAM WALSHAM, D.D., b. 1823. English hymnist; Bp. of Bedford 1879, of Wakefield 1888.

**Howard,** BLANCHE WILLIS (VON TEUFFEL, 1890), b. 1847. American novelist, residing in Germany since 1875. *One Summer*, 1875; *Aunt Serena*, 1880; *Guenn*, 1882; *Aulnay Tower*, 1886; *The Open Door*, 1889; *A Fellowe and His Wife* (with Wm. Sharp), 1892; *A Battle and a Boy*, 1893.

**Howard,** BRONSON, b. 1842. American dramatist. *Saratoga*, 1870; *The Banker's Daughter*, 1878; *Young Mrs. Winthrop*, 1882; *Shenandoah*, 1889.

**Howard,** CATHERINE, ab. 1520–1542. Granddaughter of the Duke of Norfolk; fifth wife of Henry VIII. She was tried for crimes committed previous to her marriage, to which she confessed, and with Lady Rochfort was beheaded.

Catherine Howard, by Holbein.

**Howard,** CHARLES, LORD EFFINGHAM, 1536–1624. Lord High Admiral 1585. He opposed the Invincible Armada 1588 and shared with the Earl of Essex a victorious expedition against Cadiz.

**Howard,** HENRY, EARL OF SURREY, 1517-1547. English poet, first to introduce the sonnet and blank verse; beheaded on Tower Hill on a charge of high treason, really for a court intrigue.

**Howard,** JOHN, 1726–1790. English prison reformer. His report to the Commons 1774 as Sheriff of Bedfordshire led to two reform bills. From 1775 he traveled extensively, and ab. 1780 extended his beneficent work to hospitals. He pub. *State of Prisons*, 1777-80, and *Lazarettos*, 1789. He died of the plague at Cherson on the Black Sea.

**Howard,** JOHN EAGER, 1752–1827. Officer in Revolutionary war; M.C. 1787; Gov. of Md. 1789–92; U. S. Senator 1797–1803.

**Howard,** OLIVER OTIS, U.S.A., LL.D., b. 1830. Major-gen. U. S. Vols. 1862, serving in Va. and Tenn.; Brig.-gen. U.S.A. 1864; Major-gen. 1886; commissioner Freedman's Bureau 1865–74; pres. Howard Univ. 1869–73. *Donald's School Days*, 1879; *Chief Joseph, or the Nez Perces*, 1891.

**Howard University.** In Washington, D.C.; organized 1867; intended for the higher education of negro students, but with no distinction as to race or sex. Besides the preparatory, collegiate and normal departments, it includes schools of law, medicine and theology. It had, in 1895, 587 students and 57 instructors.

**Howe,** EDGAR WATSON, b. 1854. American novelist. *Story of a Country Town*, 1883.

**Howe,** ELIAS, 1819–1867. American inventor. His sewing-machine was patented 1846; the rights were contested till 1854.

**Howe,** JOHN, 1630–1705. Puritan divine, chaplain to Cromwell 1654. *Living Temple*, 1676; *Redeemer's Tears*, 1684. His works were collected 1724, and several times reprinted.

**Howe,** JOHN IRELAND, M.D., 1793–1876. American inventor of the rotary machine for making pins 1838.

**Howe,** MARK ANTONY DE WOLFE, D.D., 1809–1895. P. E. bishop Central Pa. 1865. *Bishop Alonzo Potter*, 1871.

**Howe,** MRS. JULIA (WARD), b. 1819; m. 1843. American poet, author of the *Battle Hymn of the Republic*, 1861. *Passion Flowers*, 1854; *Life of Margaret Fuller*, 1883.—Her husband, SAMUEL GRIDLEY HOWE, M.D., 1801–1876, was a noted philanthropist.

**Howe,** RICHARD, EARL, 1725–1799. English admiral. He commanded a fleet on the American coast 1776–78, made ineffectual attempts to bring about peace, was made Viscount 1782 and Earl 1788, and defeated a French fleet June 1, 1794.—His brother, SIR WILLIAM, 1729–1814, commanded the British forces in America 1775–78, won the battles of Long Island, White Plains, Brandywine, and Germantown, occupied Phila., and became an Irish Viscount 1799.—Their elder brother, GEORGE AUGUSTUS, Viscount, 1724–1758, was killed at Ticonderoga in the French war.

**Howe,** TIMOTHY OTIS, 1816–1883. Circuit Judge of Wis. 1850–55; U. S. Senator 1861–79; Postmaster-gen. 1881–83.

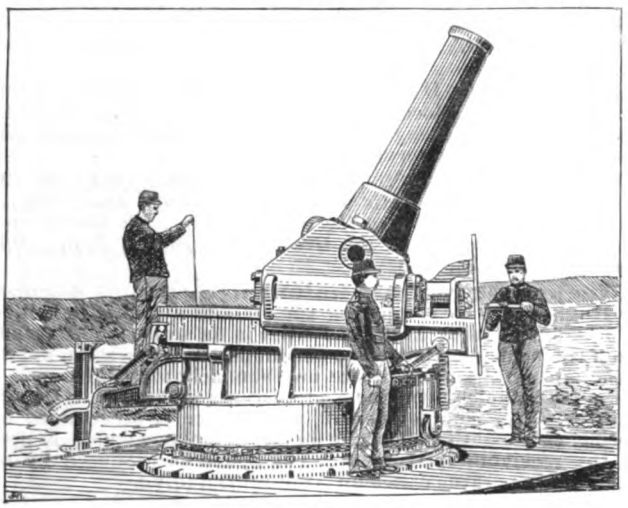
**Howell,** JAMES, ab. 1595–1666. Welsh author. *Epistolæ Ho-Eliance, or Familiar Letters*, 4 vols., 1645–55.

**Howells,** WILLIAM DEAN, b. 1837. American novelist; Consul at Venice 1861–65; ed. *Atlantic Monthly*, 1871–81. *Venetian Life*, 1866; *Italian Journeys*, 1867; *Suburban Sketches*, 1868. *Their Wedding Journey*, 1871, marked his passage from descriptive writing to fiction. *A Chance Acquaintance*, 1873; *A Foregone Conclusion*, 1874; *Lady of the Aroostook*, 1878; *Dr. Breen's Practice*, 1883; *Silas Lapham*, 1885; *April Hopes*, 1887; *A Hazard of New Fortunes*, 1889; *An Altrurian*, 1894. His light and charming style is equally marked in *The Parlor Car* and other farces.

**Howe Truss.** Bridge truss with wooden chords and struts and wrought-iron ties, invented by William Howe 1840, and extensively used for spans less than 150 feet.

**Howitt,** WILLIAM, 1795–1879. English author. *Rural Life of England*, 1837.—His wife MARY (BOTHAM), 1799–1888, bore part in many of his books, wrote verses, and tr. F. Bremer and H. C. Andersen.

**Howitzer.** Short gun originally introduced by the Dutch in the 17th century: subsequently greatly improved and used to fire spherical shells of large caliber. There is but one gun of this designation in the U. S. service, the 7-inch breech-loading



10-inch Canet Howitzer.

rifled siege mortar. It is made of steel, weighs 3,700 lbs., 12.67 calibers long, and fires an elongated hollow projectile 105 lbs. in weight, with a muzzle velocity of 1,085 f. s. and a muzzle energy of 857 tons.

**How Leang.** Chinese dynasty, reigning in n. China in 6th century, in a period of great disorder. The later Leang dynasty, founded 907 by a prince of Leang, under title of Taitsoo, came between the Tang dynasties.

**Howrah.** Modern city of British India, on the Hoogli, opposite Calcutta. Pop., 1891, 129,800.

**Howson,** JOHN SAUL, D.D., 1816–1885. Dean of Chester 1867; author, with W. J. Conybeare, of *The Life and Epistles of St. Paul*, 1850–52. *Character of St. Paul*, 1862.

**Hoy.** Small Dutch vessel, usually sloop-rigged, employed as a tender between large vessels and the shore.

**Hoyle,** EDMOND, 1672–1769. Author of *Short Treatise on Whist*, 1742. He is called the father of whist.

**H-Piece.** Section of a plunger pump in which the valves are placed.

**Huaca.** Kechua word meaning sacred, analogous to the word Wakan of the Dakotas, applied by the Peruvians to all kinds of sacred objects, including places, and especially by archæologists to the sacred vessels of pottery, commonly known as Huacas, which the ancient Peruvians buried with their dead. These objects, of which many thousands exist in museums, are of the greatest variety of form, and illustrate the plants and animals, popular customs, religious observances, even the features of the people.

**Huancas.** Ancient tribe of Peruvian Indians of the Quichua stock.

**Huascar,** d. 1533. Inca of Peru, defeated by his half-brother Atahualpa 1532, and murdered by Pizarro. This fraternal war facilitated the Spanish conquest. — His father, HUAYNA CAPAC, d. 1523, had extended his kingdom and constructed important roads.

**Hubbard,** BELA, b. 1814. Explorer and surveyor of Michigan; author of *Climate of Detroit and the Lake Region*, appended to his *Memorials of a Half Century*, 1887.

**Hubbard,** JOSEPH STILLMAN, 1823–1863. Prof. of Mathematics at the U. S. Naval Observatory 1845, author of an elaborate discussion of the theory of Biela's comet.

**Hubbard,** WILLIAM, 1621–1708. Pastor at Ipswich, Mass. *Hist. of New England*, pub. 1815.

**Hubbardton,** BATTLE OF. In Vt., July 7, 1777. Ab. 900 American militia were routed by the British.

**Huber,** FRANÇOIS, 1750–1830. Swiss writer on Bees, 1792.—His son, JEAN PIERRE, 1777–1841, pub. a book on Ants, 1810.

**Huber,** JOHANN NEPOMUK, 1830–1879. Prof. Munich 1859; Old Catholic leader: part author of *Janus*, 1869. *Quirinus*, 1871.

**Hubert,** ST., 656–757. Patron saint of hunting, son of Bertrand, Duke of Guienne. He was passionately fond of the chase, for which he neglected his religious duties until, hunting

Conversion of St Hubert, by Durer.

one Good Friday, a stag bearing a shining crucifix between its antlers met him and threatened everlasting damnation unless he reformed. The legend makes him enter a cloister and become Bp. of Liege 708.

**Hubertsberg,** PEACE OF. Feb. 15, 1763, between Frederic II. and Maria Theresa; close of Seven Years' War. It acknowledged Frederic as Lord of Silesia.

**Hubli.** Town of Hindustan, ab. 100 m. from the s.w. coast, in the Bombay presidency. Pop., 1891, 50,780.

**Hübmaier,** BALTHAZAR, 1480–1528. German Anabaptist, burned in Vienna.

**Hübner,** JOSEPH ALEXANDER, FREIHERR VON, 1811–1892. Austrian ambassador to France 1849–59. *Sixtus V.*, 1871, tr. 1872; *Travels*, 1873, tr. 1874.

**Hübner,** RUDOLF JULIUS BENNO, 1806–1882. German painter of the Düsseldorf school.

**Hübschmann,** JOHANN HEINRICH, b. 1848. Prof. Strassburg; writer on the Armenian and Persian languages.

**Huc,** ÉVARISTE RÉGIS, 1813–1860. French missionary in China 1839–49. *Travels*, 1850, tr. 1852; *Chinese Empire*, 1854, tr. 1855; *Christianity in China, Tartary, and Thibet*, 1857–58, tr. 1857–58.

**Hucbald** (HUCBALDUS DE S. AMANDO, HUBALD DE S. AMAND, HUGBALD, UBALD, or UCHUBALDUS), ab. 840–930. Monk, credited as the first writer who gave a description of part-writing in music. See ORGANUM.

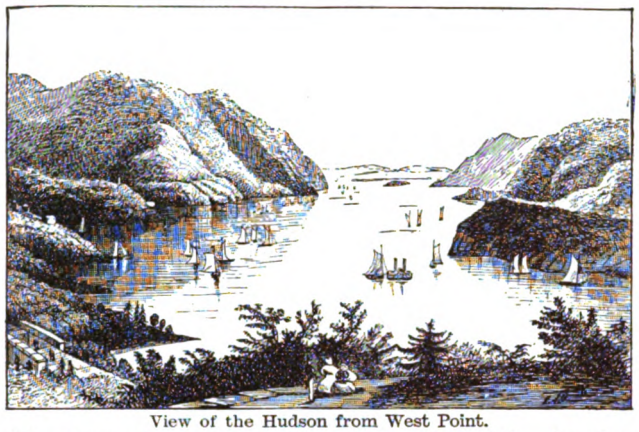
**Huckleberry.** Shrubs of the genus *Gaylussacia*, natural family *Vacciniaceæ*, natives of America. Their berries are generally edible, and esteemed as small fruits.

**Huckleberry,** SQUAW. See DEERBERRY.

**Huddersfield.** Borough of Yorkshire, on the Colne, 17 m. s.w. of Leeds. It has large woolen manufactures. Pop., 1891, 95,422.

**Hudson.** Largest river of N. Y. It heads in the Adirondack Mts., flows s. to its mouth at New York City, and is tidal and navigable to Albany. Drainage area 13,248 sq. m., length

ab. 300 m. In many places the scenery is extremely picturesque.



View of the Hudson from West Point.

**Hudson,** ERASMUS DARWIN, M.D., 1806–1880. American surgeon.—His son and namesake, 1843–1887, was a physician in New York and professional writer.

**Hudson,** GEORGE, 1801–1871. English railway speculator, ruined 1848; M.P. 1845–59.

**Hudson,** HENRY, d. 1611. Discoverer, 1609–10, of the river, strait, and bay which bear his name; set adrift by mutineers, and lost at sea.

**Hudson,** HENRY NORMAN, LL.D., 1814–1886. American Shakespearean.

**Hudson,** MRS. MARY (CLEMMER), formerly Mrs. Ames, 1839–1884. American journalist, novelist and poet.

**Hudson's Bay.** Large inland sea in British N. America, connected with the Atlantic by Hudson's Strait and with the Arctic Ocean by numerous channels.

**Hudson's Bay Company.** Organized 1670 for fur-trading. It built forts in the wilderness, conducted a lucrative trade, and exercised absolute authority, especially after the British conquest 1763; was opposed from 1783 by the Northwest Co., which it absorbed 1821 and acquired 1838 a renewed monopoly which expired 1869.

**Hudson River Shale.** Mass of calcareous shales, forming the upper part of the Ordovician or Lower Silurian system. See ORDOVICIAN.

**Hudson River Tunnel.** Between Jersey City and N.Y.; 18 ft. in diameter, length 5,400 ft. between bulkheads. Construction began 1879, but was suspended 1882–89. It was nearly completed 1892, leaving 1,600 ft. yet to be constructed.

**Hueffer,** FRANCIS, 1845–1889. German-English writer on music; biographer of Wagner 1874–81. *The Troubadours*, 1878.

**Huel,** or WHEAL. Cornish term signifying a mine.

**Huerta,** VICENTE GARCIA DE LA, 1730–1787. Spanish dramatist and poet. *Raquel*, 1778.

**Huet,** CONRAD BUSKEN, 1826–1886. Dutch critic; pastor at Haarlem 1851–62; journalist in Java 1867–76; finally resident in Paris. *Phantasien*, 10 vols., 1868–85.

**Huet,** FRANÇOIS, 1814–1869. French Neo-Catholic.

**Huet,** JEAN BAPTISTE, 1745–1811. French painter of natural history subjects. He was received as an Academician 1769 and exhibited till 1802. His *Two Dogs* is in the Louvre, and other works are at Orleans, Nantes, and Rennes.

The Milkmaid, by J. B. Huet.

**Huet,** PIERRE DANIEL, 1630–1721. Bp. of Avranches 1689–99. He wrote much in philosophy and theology, and on the classics.

**Hufeland,** CHRISTOPH WILHELM, 1762–1836. Prof. Jena 1793 and Berlin 1798; medical writer. *Makrobiotik*, 1796.

**Hug,** JOHANN LEONHARDT, 1765–1846. R. C. prof. Freiburg from 1791. *Introd. N. T.*, 1808, tr. 1827.

**Hügel,** KARL ALEXANDER ANSELM, FREIHERR VON, 1796–1870. Austrian officer and traveler. *Kashmir*, 1840–42; *Cabul*, 1851–52.

**Huggins,** WILLIAM, LL.D., D.C.L., F.R.S., b. 1824. English astronomer.

**Hugh,** ST., ab. 1135–1200. B. in Burgundy; Bp. of Lincoln 1186; canonized 1220.

**Hugh Capet,** 940–996. Founder of the Capetian dynasty which ruled France for 8 centuries; enthroned by the nobles 987.

**Hugh of Lincoln.** Traditional victim of Jews 1255; subject of Mediæval legends and ballads.

**Hughes,** BALL, 1806–1868. English-American sculptor.

**Hughes,** DAVID EDWARD, F.R.S., b. 1831. Inventor of the printing telegraph 1855, the microphone 1878, and the induction balance 1879.

**Hughes,** HUGH PRICE, b. 1847. English Wesleyan; ed. *Methodist Times*, 1885. *Social Christianity*, 1889; *Ethical Christianity*, 1892.

**Hughes,** JOHN, D.D., 1797–1864. B. in Ireland; Bp.-coadjutor of N. Y. 1838, Diocesan 1842. The see was made an archbishopric 1850. He engaged in several controversies, and rendered notable public services 1861–63.

**Hughes,** THOMAS, 1823–1896. English author; M.P. 1865–74, Q C. 1869, judge 1882. His *Tom Brown's School Days*, 1856, is still popular. *Scouring of the White Horse*, 1858; *Tom Brown at Oxford*, 1861; *Alfred the Great*, 1869; *Rugby, Tenn.*, 1881; *Vacation Rambles*, 1896.

**Hughes' Induction Balance.** Apparatus described by Hughes 1879 for comparing the specific dynamic induction of different metals. It is differential in its action and depends upon the principle that when the induction is the same in two pieces of metal similar in size and similarly placed, there is a complete balance in the induced currents generated in the apparatus. The completeness of the balance is ascertained by noting the cessation of sound in the telephone which is used as the receiving instrument. The sound is produced by an auxiliary apparatus called an AUDIOMETER (q.v.).

**Hugo,** VICTOR MARIE, 1802–1885. French poet, dramatist, and novelist, head of the romantic school; Academician 1841, ennobled 1845, exiled 1851, Senator 1876. His earliest works were *Odes*, etc., 1822–26, and the romances *Bug-Jargal*, 1818–26, and *Hans of Iceland*, 1825. His chief plays are *Cromwell*, 1827; *Marion Delorme* and *Hernani*, 1829; *Le Roi s'Amuse* and *Lucretia Borgia*, 1832; *Mary Tudor*, 1833; *Angelo*, 1835; *Ruy Blas*, 1838; *Les Burgraves*, 1842; and *Torquemada*, 1882. His first great novel was *Notre Dame de Paris*, 1830–31. *Literature and Philosophy* appeared 1834, and *The Rhine*, 1838. His vehement republicanism spoke in *Napoleon the Little*, 1852. *Les Châtiments*, 1853, and *History of a Crime*, 1877. While living in Jersey, he produced also *Contemplations*, 1856, several volumes of verse, *Les Miserables* (his most famous work), 1862, *Travailleurs de la Mer*, 1866, *L'Homme qui rit*, 1869, and a critical work, *Shakespeare*, 1864. His publications after his return to Paris, 1870–71, were chiefly poetic, and these have continued since his death, for he left an immense number of MSS.

**Huguenots,** French Protestants, so called ab. 1560; long

Massacre of St. Bartholomew, by Dubois d'Amiens, 1584.

persecuted, protected by the Edict of Nantes 1598, exiled or persecuted on its revocation 1685. They settled largely in

England, Holland, and America. See COLIGNY, HENRY IV., and BARTHOLOMEW, ST.

**Huguenot Wars.** In France, ab.1560–97, under the leadership of Condé. Coligny, and Henry of Navarre; renewed 1621–28, when Rochelle was taken, Oct. 28, after a 14 months' siege.

**Huldah.** Hebrew prophetess, who foretold to Josiah the overthrow of Israel.

**Hulin,** PIERRE AUGUSTIN, 1758–1841. French general, Count 1808, exiled 1815–19.

**Hulking.** Mining term; removing the softer parts of the ore in a vein with a pick, preparatory to blasting down the harder parts.

**Hull,** or KINGSTON-ON-HULL. Borough of Yorkshire, on the Humber; constituted 1299. It has a very large foreign commerce, and ranks third of British ports. Pop., 1891, 199,991.

**Hull.** City of Ottawa co., Quebec, opposite Ottawa. Pop., 1891, 11,265.

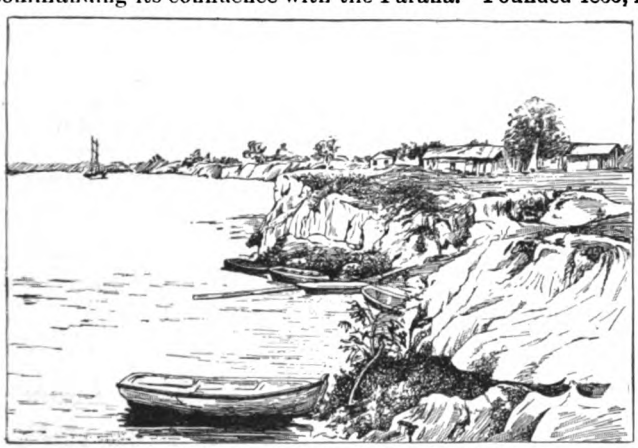
**Hull,** EDWARD, b. 1829. Director of the Geological Survey of Ireland; author of several works on Physical Geology, the coal-fields of Great Britain, and Triassic and Permian Rocks.

**Hull,** WILLIAM, 1753–1825. Officer in the American Revolution. Gov. of Mich. 1805–12. As commander of the army of the northwest he surrendered Detroit and his troops to the British, Aug. 16, 1812. For this he was court-marshaled and sentenced to death, but was reprieved. History has reversed the verdict, finding him the victim of circumstances and a scapegoat for others' faults.—His nephew, ISAAC, 1773–1843, commanding the U. S. frigate *Constitution*, took the *Guerrière*, Aug. 19, 1812.

**Hullah,** JOHN, 1813–1884. English teacher, composer, and compiler of music. *Hist. Modern Music*, 1862.

**Hulsean Lectures.** On Christian Evidences; delivered annually before Univ. Cambridge, on the foundation of John Hulse, 1708–1789.

**Humaita.** Fortified town in Paraguay, on the Paraguay, commanding its confluence with the Parana. Founded 1855, it



Humaita—View taken from the Banks of the Paraguay.

was the strongest fortress in S. America till captured and dismantled by the allied Brazilians and Argentines 1868. Pop. ab. 4,000.

**Humane Society.** Founded 1774 in London for the rescue or resuscitation of persons in danger of drowning or asphyxiation. It presents medals, money, or testimonials to life-savers.

**Humanists.** Classical scholars of the renaissance, ab. 1500–1600.

**Humanitarian.** In Ethics and Theology, one who bases his views and motives on human facts, relations, and duties; sometimes a denier of Christ's divinity.

**Humanity.** In Ethics, disposition which leads one to wish for the welfare and happiness of all mankind.

**Humbert,** b. 1844. King of Italy since 1878; eldest son of Victor Emanuel.

**Humbleton.** See HOMILDON HILL.

**Humboldt,** FRIEDRICH HEINRICH ALEXANDER, FREIHERR VON, 1769–1859. German naturalist; assessor of mines 1792–97. He traveled in S. and Central America 1799–1804; lived mostly at Paris 1804–27, and thenceforth at Berlin; traversed Asiatic Russia 1829, and was often employed in diplomatic missions, 1830–48. The scientific fruits of his American journeys alone fill 30 vols. His greatest work is *Kosmos*, 4 vols., 1845–59.—His brother, KARL WILHELM, 1767–1835, was Prussian Minister at Rome 1801–8, and at Vienna 1810–15; was active in founding the Univ. of Berlin; was prominent in public affairs till 1819, and later in science and letters, and gave a great impulse to the infant science of comparative philology. *Letters*, 1847, tr. 1849. *Works*, 7 vols., 1841–52.

**Humboldt River.** In Nevada. It heads in Elko co., flows generally s.w., cutting across numerous mountain ranges, and finally sinks in Humboldt Lake, near the e. base of the Sierra Nevada. Drainage area 32,148 sq. m., length 384 m.

**Hume,** DAVID, 1711–1776. Scottish historian and philosopher. His *History of England*, a partisan defense of Tory principles, was pub. in three instalments, reversing the order of time, the Stuarts 1754–57, the Tudors 1759, the earlier part 1762. *Treatise on Human Nature*, 1739–40; *Essays*, 1741; *Human Understanding*, 1748; *Principles of Morals*, 1751; *Political Discourses*, 1752; *Dissertations*, 1757. His argument against miracles has often been quoted and contested. His system of skepticism, founded upon a reductio ad absurdum of the philosophy of Locke and Berkeley, resolved causality into association, and denied the evidence for the existence of matter, of the soul, and of God, on the basis of pure sensationalism. In ethics he was an adherent of the "moral sense" school and of utilitarianism.

**Hume,** FERGUS W., b. 1856. English novelist. *Hansom Cab*, 1887; *Mme. Midas*, 1888.

**Hume,** JOSEPH, 1777–1855. M.P. from 1818; active, independent, and unflinching in pushing reforms of every kind, many of which he carried against great opposition.

**Humerus.** Bone of the arm, extending between the shoulder and the elbow.

**Humfrey** (HUMPHRY or HUMPHRYS), PELHAM, 1647–1674. English composer of church music, sent to France and Italy by Charles II.; pupil of Lully in Paris; master of the children of the Chapel Royal, and Composer-in-Ordinary for the King's Violins.

**Humidity.** Amount of moisture in the air. Since water-vapor necessarily exerts pressure, absolute humidity may be determined by the barometer. The amount of vapor which the air can hold depends on the temperature; the ratio of vapor held to that which it would hold at the temperature if saturated, is called the relative humidity, and may be indicated by wet and dry bulb thermometers. See HYGROMETRY.

**Humiliates.** Benedictine orders founded ab. 1135 and later.

**Humility.** Absence of self-complacency and of the expectation of outward marks of respect.

**Humiriaceæ.** Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Dicotyledons*, comprising four genera and ab. 32 species, mostly natives of Brazil or Guiana.

**Hummel,** JOHANN NEPOMUK, 1778–1837. German pianist and composer, for two years a pupil of Mozart. Several of his compositions, among them three of his seven pianoforte concertos and a septet in D minor, are still played.

**Humming Birds.** Picarian birds, almost confined to S.

Humming Bird.

America. Ab. 400 species are known. They have long slender bills and protrusible tubular tongues, adapted for securing

nectar from flowers. They take also insects, but cannot live in localities whence flowers in bloom are absent. The wings are long, narrow, and pointed, the manus being extra long, the humerus short. They are extraordinarily rapid flyers, and are the most gorgeously colored of birds, especially the males. All are small, some less than an inch in length. They present numerous remarkable conformations of the tail.

**Humor.** Faculty akin to wit on one hand, and on the other to sympathy and sentiment; prominent in modern literature, especially in that of England and America, wherein the humorists have a distinct and important place.

**Humperdinck,** ENGELBERT, b. 1854. German musician, composer of *Hänsel und Gretel*, 1893.

**Humphreys,** ANDREW ATKINSON, LL.D., U.S.A., 1810–1883. In charge of Coast Survey Office 1842–49; active in the Va. campaigns and in topographical surveys; Brig.-gen. 1866; chief of engineers 1866–79.

**Humphreys,** DAVID, LL.D., 1752–1818. American poet: officer in the Revolutionary war; Minister to Portugal 1791–98, and to Spain 1798–1802; gen. of Conn. militia 1812.

**Humphry,** GEORGE MURRAY, M.D., LL.D., b. 1820. English anatomist.

**Hundred.** Subdivision of a county in parts of England and of the U. S.; union of townships for purposes of defense or administration. It dates from a very early period of Germanic history, and had mostly disappeared in England by 1560. The name is common in the early period of Va., was used in Md. till 1824, and is still employed in Delaware. The Hundred Court, now obsolete, in which the freemen were the judges and the steward the registrar, was not a court of record; its proceedings were reviewable by writ of false judgment.

**Hundred Days.** Between Napoleon's return from Elba and his overthrow at Waterloo and final abdication, March 1 to June 22, 1815.

**Hundred Years' War.** Between France and England, 1337–1453. The English, who were always the attacking party, wished to strengthen and extend their dominion in France; the French hoped to drive them out. By the Peace of Bretigny, May 8, 1360, Edward III. renounced the throne of France, and surrendered his claims on French territory n. of the Loire, but kept his possessions in the s. and w., with part of Picardy. The treaty of Troyes, May 21, 1420, secured the French crown to Henry V. of England by exclusion of the Dauphin, on the death of Charles VI. The war ended with the siege of Castillon, and death of Talbot, July, 1453, when the English lost all that remained to them in France, except Calais, Havre, and Guiness Castle. This war included the famous battles of Crecy, Poictiers, and Agincourt; the result was determined by the heroic enthusiasm of Joan of Arc.

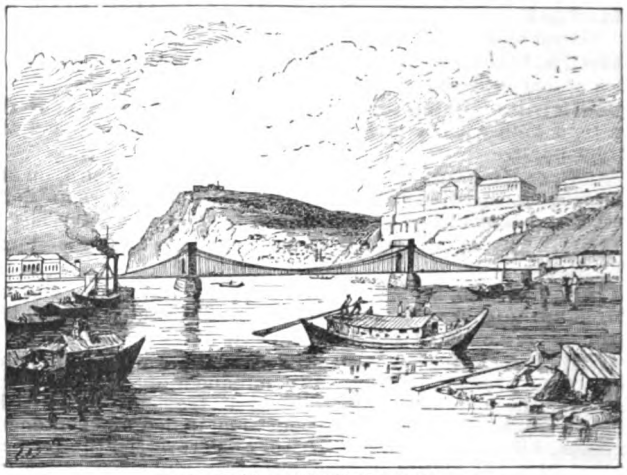
**Hunfalvy,** PAL, b. 1810. Hungarian writer on the national language and antiquities.—His brother, JANOS, 1820–1888, prof. Pesth 1870, was a geographer and historian.

**Hungarian Grass.** See MILLET.

**Hungarian** (or MAGYAR) **Language.** Member of the Ugrian or Finno-Hungarian family of languages, and agglutinative in its structure. Latin was long the speech of educated Hungarians, and the native literature is of comparatively recent growth.

**Hungarian Music.** The fact that the musical practitioners of Hungary are chiefly Gypsies has given rise to the erroneous belief that Hungarian music is Gypsy music. Liszt helped to spread the error by means of his book *Des Bohémiens et de leur musique en Hongrie*, in which he tells of the origin of his popular *Rhapsodies Hongroises*. The fact is that the melodies played by the Hungarian Gypsies are genuine Magyar folk-tunes, belonging to songs some of which are of great antiquity. The most marked peculiarities of Hungarian music are the scale, containing superfluous seconds (thus, a, b, c, d-sharp, e, f, g-sharp, a), and a rhythm like that called the Scotch map or catch, in which the emphasis is shifted from the strong to the weak part by making the first note take only a fraction of the time of the second. This rhythm is a direct product of the Magyar language. In his Hungarian Rhapsodies Liszt has copied the character of the national dance called Czardas, which consists of two movements, *Lassu* and *Friss*, the former slow, the latter fast. These alternate at the will of the dancer, who gives a sign to the band when he wishes to change from one to the other.

**Hungary.** E. and larger part of Austrian Empire; area ab. 125,000 sq. m.; settled by the Magyars, a Scythian race, led by Arpad 889–899; ruled by his descendants, as chiefs, till 1000, and as kings till 1301, by kings of foreign origin till 1526, and thenceforth by the House of Hapsburg. Christianity was introduced under St. Stephen, the first king, who d. 1038. This put an end to incursions into neighboring countries. Colonists from Flanders in the 12th century gave a new impulse to industry, especially to mining. The Golden Bull, or Magna Charta



The Bridge of Pesth, Hungary.

of Hungary, was issued 1222. From the death of Matthias Corvinus, 1490, peace was broken by fierce factions and Turkish incursions. The peasant war ended 1514 in the reduction of the peasantry to serfdom. After the battle of Mohàcs, 1526, H. belonged to AUSTRIA (q.v.).

**Huniades.** See HUNYADY.

**Hunkers.** Nickname, 1844–60, of the conservative democracy of N. Y., opposed to the "loco-foco" or radical faction. The division existed from 1835.

**Huns.** Turanian nomads from the plains n. of China. Part settled by the Caspian Sea, part drove the Goths across the Danube 376. Under Attila they ravaged the fairest portions of the Roman Empire 434–453, ceasing only on payment of tribute. They disappear from history soon after Attila's death.

**Hunt,** MRS. HELEN MARIA (FISKE), 1831–1885. American poet and novelist, known at first as "H. H."; m. 1852 to Capt. Edward B. Hunt, who d. 1863, and 1875 to Wm. S. Jackson of Colorado Springs. *Verses*, 1870; *Bits of Travel*, 1872–78; *Mercy Philbrick's Choice*, 1876; *Story of Boon*, 1879. Her most important books, *A Century of Dishonor*, 1871, and *Ramona*, 1874, championed the cause of the Western Indians.

**Hunt,** HENRY, 1773–1835. English radical, imprisoned 1819–22.

**Hunt,** HENRY JACKSON, U.S.A., 1819–1889. Chief of Artillery, Army of the Potomac, 1862–65.

**Hunt,** JAMES HENRY LEIGH, 1784–1859. English poet and essayist; ed. *Examiner*, 1808; imprisoned 1813–15; pensioned 1847. *Story of Rimini*, 1816, *Lord Byron*, 1828; *Men, Women, and Books*, 1847; *Autobiography*, 1850.

**Hunt,** RICHARD MORRIS, 1828–1895. American architect. He planned the Lenox Library and other notable edifices in New York, and the Administration Building at the World's Columbian Exposition, Chicago, 1893.

**Hunt,** THOMAS STERRY, LL.D., F.R.S., 1826–1892. Born in Conn. Chemist and mineralogist to the Canadian Geological Survey 1847–72; Prof. of Chemistry at Laval Univ., Quebec, 1856–62, and at McGill Univ., Montreal, 1862–68; Prof. of Geology in Mass. Inst. of Technology 1872–78. He pub. ab. 200 monographs, many of them of great value to chemical geology. *Chemistry of the Earth*, 1869; *New Basis for Chemistry*, 1887; *Mineralogy*, 1889.

**Hunt,** VIOLET, b. 1860. English novelist. *A Hard Woman*, 1895.

**Hunt,** WARD, LL.D., 1810–1886. Judge N. Y. Court of Appeals 1865–72; Associate-justice U. S. Supreme Court 1872–82.

**Hunt,** WASHINGTON, 1811–1867. M.C. 1843–49; Comptroller of N. Y. 1849, Gov. 1851–53.—His brother, EDWARD BISSELL, U.S.A., 1822–1863, was noted as a military engineer.

**Hunt,** WILLIAM HENRY, 1790–1864. English water-color painter, R.A. 1827.

**Hunt,** WILLIAM HENRY, 1824–1884. Judge La. Court of Claims 1878; Sec. U. S. Navy 1881; Minister to Russia 1882.

**Hunt,** WILLIAM HOLMAN, b. 1827. English painter; one of the PRE-RAPHAELITES (q.v.). His *Light of the World* is in

From the Finding of Christ in the Temple, by W. Holman Hunt.

Keble College, Oxford. His *Shadow of the Cross, Scape Goat,* and other works attracted much attention.

**Hunt,** WILLIAM MORRIS, 1824–1879. Painter, brother of Richard M.; pupil of Couture and J. F. Millet; active in Boston as a teacher; one of the first to introduce broad methods in recent American art. He has frescoes in the Capitol at Albany.

**Hunter,** DAVID, U.S.A., 1802–1886. Major-gen. U. S. Vols. 1861–66; noted for efforts to abolish slavery in S. C., in advance of Pres. Lincoln's proclamation.

**Hunter,** JOHN, F.R.S., 1728–1793. Scottish surgeon and anatomist, practicing in London from 1763; very eminent as an operator. His museum, started 1785, was bought for the College of Surgeons. His works were collected 1835.—His brother WILLIAM, 1718–1783, was only less eminent in the same field.

**Hunter,** ROBERT MERCER TALIAFERRO, 1809–1887. M.C. from Va. 1837–41 and 1845–47; Speaker 1839; U. S. Senator 1847–61; Treasurer of Va. 1877.

**Hunter,** WILLIAM, D.D., 1811–1877. Irish-American M. E. divine and hymnist; ed. Pittsburg *Christian Advocate;* Prof. Allegheny Coll. 1855–70.

**Hunter,** SIR WILLIAM WILSON, b. 1840 in Glasgow. Director-gen. of Indian statistics 1872; knighted 1887. *Dict. non-Aryan Languages,* 1868; *Rural Bengal,* 1868; *Orissa,* 1872; *Assam,* 1880; *Gazetteer of India,* 1881–88; *Indian Empire,* 1882.

**Hunter's Moon.** Full moon after the HARVEST MOON (q.v.).

**Hunting Dog.** See HYENA DOG.

**Huntingdon,** SELINA, COUNTESS OF, 1707–1791. Founder of a seminary at Trevecca, Wales, 1768, and of a Calvinistic-Methodist "connection" for which she built 64 chapels. She was the most efficient promoter of Whitefield's doctrines.

**Hunting State.** State of society in which the main supply of food is derived from hunting and fishing; characteristic of savage races, small populations, and primitive manners. Only on emergence from it has any community ever made economic or social advances.

**Huntington.** Capital of Cabell co., W. Va., on the Ohio; settled 1871. Pop., 1890, 10,108.

**Huntington,** DANIEL, N.A., b. 1816. American painter, best known by his portraits; pres. National Academy 1862–69 and 1877–89.

**Huntington,** FREDERIC DAN, D.D., LL.D., b. 1819. Unitarian pastor in Boston 1842–55; prof. Harvard 1855–60; rector in Boston 1861; P. E. bp. of Central N. Y. 1869. *Believing and Living,* 1860; *Lent,* 1872–76.

**Huntington,** SAMUEL, LL.D., 1731–1796. In Congress 1776–83, and its pres. 1779–81; signer of the Declaration of Independence; Judge of Conn. Supreme Court 1774–84. Chief-justice 1784; Lieut.-gov. 1785, Gov. from 1786.—His nephew, SAMUEL, 1765–1817, was Chief-justice of Ohio, and its Gov. 1808–10.

**Huntington,** WILLIAM REED, D.D., D.C.L., b. 1838. Rector at Worcester, Mass., 1862–83, and since of Grace Ch., N.Y.; chief reviser of the Prayer Book 1892. *The Church Idea,* 1870; *Conditional Immortality,* 1876.

**Huntsman's Cap.** See PITCHER-PLANT.

**Hunt the Slipper.** Game in which a slipper is hidden, the players sitting in a circle with one in the middle, who guesses which has the slipper, which is passed from one to another.

**Hunyady,** JÁNOS, surnamed CORVINUS, 1387–1456. Gov. of Hungary, and its defender against the Turks; defeated at Varna 1444, and at Kossovo 1448; victor at Belgrade 1456.—His son, MATTHIAS CORVINUS, became king.

**Huon** OF BORDEAUX. Hero of a French metrical romance, ab. 1200, extant in a prose version of ab. 1450.

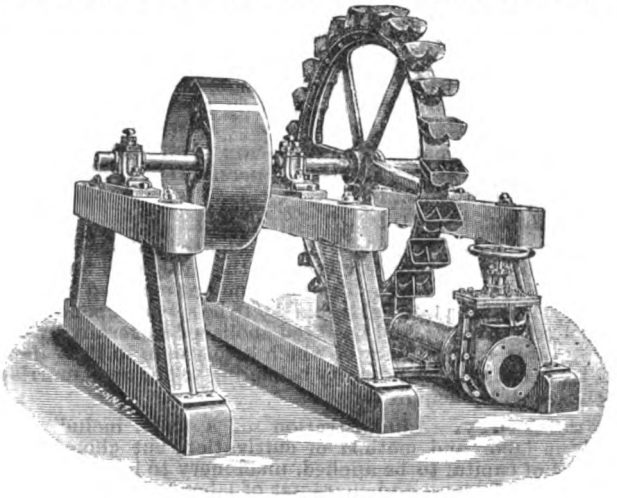
**Hupfeld,** HERMANN CHRISTIAN CARL FRIEDRICH, 1796–1866. German commentator, prof. Marburg 1825 and Halle 1843. *The Psalms,* 4 vols., 1855–61.

**Hur.** Helper of Moses; in Jewish tradition, helper of Miriam. Ex. xvii. 10.

**Hurd,** RICHARD, D.D., 1720–1808. Bp. of Lichfield 1774 and of Worcester 1781; noted for his *Dialogues,* 1759, and his close relations with Bp. Warburton. *Works,* 8 vols., 1811.

**Hurdy-Gurdy.** Ancient musical instrument called Leyer or Bauernleyer, having a flat, oblong sounding-board over which are stretched four gut-strings, vibrated by a wooden wheel turned by a handle. It will play only the simplest melodies.

**Hurdy-Gurdy Wheel.** Wheel driven by the impact of water, under high pressure, striking with great velocity concave paddles arranged about the circumference of the wheel. The illustration shows the Pelton wheel, which is driven by



Hurdy-Gurdy Wheel.

water issuing from a nozzle. One of these wheels at the Comstock mines in Nevada is 36 in. in diameter, makes 1,150 revolutions per minute under a head of 2,100 feet, and with a nozzle of one-half in. in diameter produces 100 horse-powers.

**Hurlbert,** WILLIAM HENRY, 1827–1895. Ed. N. Y. *World* 1876–83; in London 1883–91, then a fugitive. *Gan-Eden,* 1854. The original form of his name, HURLBUT, was preserved by his brother, STEPHEN AUGUSTUS, 1815–1882, Major-gen. U. S. Vols. 1862–65, Minister to Colombia 1869–72, to Peru 1881, M.C. from Ill. 1873–77.

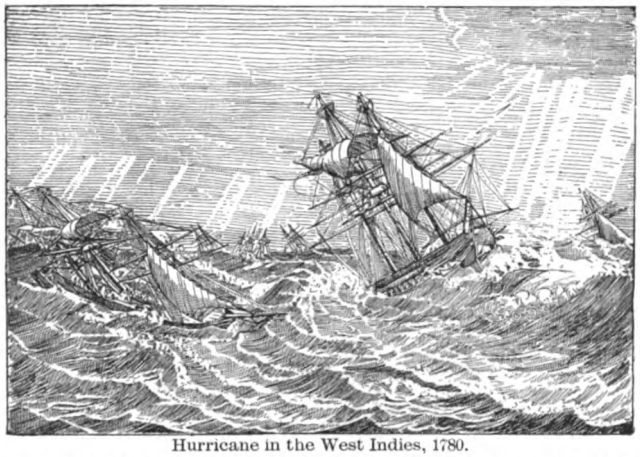
**Huron.** One of the Great Lakes of N. America, between Mich. and Canada. Its outlet is by St. Clair River, Lake St. Clair, and Detroit River, into Lake Erie. Area, including Georgian Bay, 22,322 sq. m., extreme length 263 m., extreme breadth 101 m., greatest depth 750 ft., mean depth ab. 200 ft., elevation 582 ft., drainage area 74,000 sq. m.

**Huronian.** Series of contorted and metamorphosed stratified rocks, exposed over a region on the n. coast of Lake Huron and lying unconformably upon the Laurentian. They are found also in several other parts of the world, and have yielded one or two doubtful fossils. See COLUMN.

**Hurons.** Indian tribes originally living e. of Lake Huron, and of the same ethnic stock as the IROQUOIS (q.v.). They consisted of five confederated tribes, and allied several Algonquin tribes with themselves, to oppose the powerful Five Nations of N. Y., by whom they were nearly exterminated 1649–50.

**Hurricanes.** Violent whirlwind storms that pass over the W. Indies. As they travel individually over the whole N. Atlantic Ocean, e. America and w. Europe, the name is frequently applied to any extensive rotatory storm occurring over this wide region. As similar storms occur in other parts of

the world, it is sometimes used as equivalent to any extensive violent whirlwind.—Also, the intensity of any wind of great and destructive violence: specifically restricted in meteorology



Hurricane in the West Indies, 1780.

to winds of the force of 12 on the Bradford scale or 10 on the decimal scale, or exceeding 80 miles per hour or 40 meters per second on the absolute scale.

**Hurst,** JOHN FLETCHER, D.D., LLD., b. 1834. Pres. Drew Theol. Sem. 1873, M. E. bp. 1880. *Hist. Rationalism*, 1866; *Indika*, 1891; with Dr. G. R. Crooks, *Theol. Encycl.*, 1884.

**Hurtado de Mendoza,** ANDRES, MARQUIS OF CAÑETE, ab. 1500–1561. Viceroy of Peru from 1555.—His son, GARCIA, 1535–1609, was Gov. of Chili 1557–60 and Viceroy of Peru 1589–96.

**Hurter,** FRIEDRICH EMANUEL VON, 1787–1865. Austrian historiographer, of Swiss birth. *Innocent III.*, 4 vols., 1834–42; *Ferdinand II.*, 10 vols., 1850–62.

**Hus,** JOHN. See HUSS.

**Husband and Wife.** By a fiction of common law one person; the wife's property became the husband's and he became liable for her debts. This doctrine was modified by equity, which permitted the wife's property to be settled upon trustees for her separate use, and has been abolished generally by modern statutes, the tendency of which is to secure to the wife full and free control over property belonging to her upon marriage, or subsequently acquired.

**Husbandry.** Administration of a farm, including not only the labor and method of cultivation, but choice of the amount of capital to be applied, machinery to be used, system of rotation of crops, and character of labor to be employed.

**Husbandry,** PATRONS OF. See FARMERS' ORGANIZATIONS.

**Huskisson,** WILLIAM, 1770–1830. M. P. 1796; Sec. of the Treasury 1804 and 1807–9; Pres. Board of Trade 1823; Colonial Sec. 1827; introducer of financial and economic reforms. *Speeches*, 1831.

**Huss,** HENRY HOLDEN, 1862. American composer.

**Huss,** JOHN, 1369–1415. Bohemian reformer and martyr. He received the doctrines of Wiclif, and spread them abroad by his teachings in the Univ. of Prague and the Bethlehem Chapel. In 1412 he preached against indulgences. Going to the Council of Constance with the Emperor's safe-conduct, he was imprisoned Nov. 28, 1414, tried for heresy June 1415, and burned July 6. His fate had weighty results in central Europe. After Wiclif he was the most important precursor of the Protestant Reformation.

John Huss.

**Hussars.** Cavalry raised in Hungary 1458 by M. Corvinus; now, light cavalry of any European army. In the British army there are 13 regiments of hussars, the men being armed with a saber, carbine, and pistol; the weight carried by the horse is ab. 250 lbs.

**Hussite Wars.** 1419–36; following on the violent measures adopted for the conversion of the followers of John Huss in Bohemia. See CALIXTINES, TABORITES, and ZISKA.

**Hutch.** Box containing water into which the ore particles fall that pass through the sieve in the process of jigging. The ore thus collected is called hutch-work.

**Hutcheson,** FRANCIS, 1694–1746. Prof. Univ. Glasgow from 1729; founder of the Moral Sense doctrine. *Ideas of Beauty and Virtue*, 1720; *The Passions*, 1728; *Moral Philosophy*, 1755.

**Hutchins,** CHARLES CLIFFORD, b. ab. 1860. Prof. of Physics at Bowdoin Coll., inventor of a delicate thermo-galvanic pile, with which he was the first to measure the radiating power of ordinary moist and dusty air.

**Hutchins,** THOMAS, 1730–1789. American geographer. *Description of Va., Pa., Md., and N. C.*, 1778; *La. and West Fla.*, 1784.

**Hutchinson,** MRS. ANNE (MARBURY), ab. 1590–1643. Antinomian. Her doctrines caused such commotion in Boston 1634–37 that she was driven to R. I. Removing 1642 to the vicinity of New York, she was killed by Indians.—Her great-great-grandson, THOMAS, 1711–1780, was Lieut-gov. of Mass. 1758, Chief-justice 1760, and Gov. 1771–74.

**Hutchinson,** JOHN, 1616–1664. Lieut.-col. in the Parliament's army 1642; Gov. of Nottingham, which he held against the king's forces 1643; M.P. 1646; one of the judges of Charles I.; imprisoned 1663; best known through *Memoirs* by his widow, pub. 1806 and 1885.

**Hutchinson,** JOHN, 1674–1737. English lay theologian, whose erratic opinions were cherished by many. *Works*, 12 vols., 3d ed., 1748–49.

**Hutten,** ULRICH VON, 1488–1523. German poet and satirist, knighted 1517. He led a wandering and troubled life, and for his attacks upon the clergy was forced to fly to Switzerland. Some of his writings promoted the Reformation.—His cousin, PHILIP, ab. 1500–1546, left an account, pub. 1765, of adventures in Venezuela.

**Hutter,** LEONHARD, 1563–1616. Lutheran theologian; prof. at Wittenberg 1596. *Compendium*, 1610, tr. 1867.

**Hutton,** CHARLES, LL.D., F.R.S., 1737–1823. Prof. of Mathematics at Woolwich 1773–1807; author of numerous experimental investigations on the resistance of the air to projectiles, force of the wind, etc.

**Hutton,** FREDERICK REMSEN, Ph.D., b. 1853. Prof. of Mechanical Engineering in Columbia Coll. 1881; author of professional papers.

**Hutton,** JAMES, 1726–1797. Scottish pioneer in geology. His *Theory of the Earth*, 1785–95, was the first attempt to explain the former changes of the earth's crust by reference exclusively to natural agents, and to advocate the view that the present state of things is the outcome of a former one, and that the facts of geology require for their explanation a vast series of years. His teachings were too advanced for his times, and were lost sight of in the controversy then raging between the Plutonists and Neptunists.

**Hutton,** LAURENCE, b. 1843. American author. *Plays and Players*, 1875; *Literary Landmarks of London*, 1885, and *of Edinburgh*, 1890.

**Hutton,** RICHARD HOLT, b. 1826. English essayist; ed. *Spectator*.

**Hutton,** WILLIAM RICH, b. 1826. Chief engineer of the Washington Bridge in New York and of the Hudson River Tunnel.

**Huttonian Theory.** See HUTTON, JAMES, and PLUTONISM.

**Huvette.** Close-fitting steel skull-cap used by soldiers from ab. 1340.

**Huxley,** THOMAS HENRY, LL.D., F.R.S., 1825–1895. Medical officer in British navy 1846–50; prof. School of Mines 1854–85, and in Royal Coll. of Surgeons 1863–69; pres. Geological Society of London 1869–70; pres. British Association 1870, and Royal Society 1883. He was for many years the leading exponent of Darwin's work on the *Origin of Species*, and in his lectures on *Man's Place in Nature*, 1860–63, extended the doctrine to include the evolution of man. The controversial writings of his later years were directed principally against theologians and other conservatives who opposed the new teaching. Few men have covered a wider field in science, and from every part of it he gathered valuable material. *Physical Basis of Life*,

1868; *Lay Sermons*, 1870; *Science and Culture*, 1881; *Evolution and Ethics*, 1893.

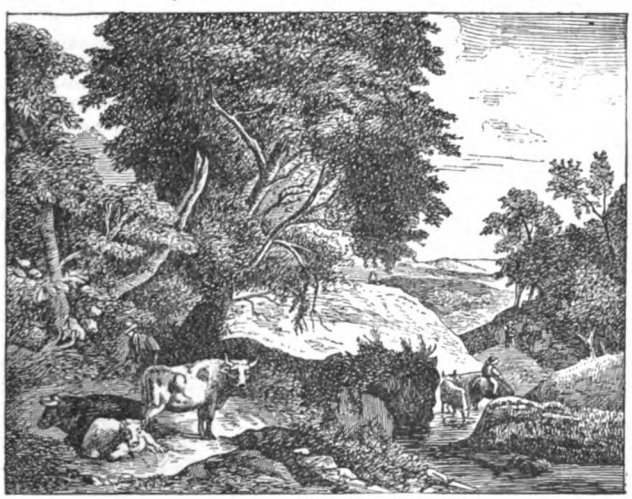
Thomas H. Huxley.

**Huydecoper,** BALTHASAR, 1695–1788. Dutch philologist, dramatist, and poet. *Achilles*, 1719.

**Huygens,** or **Huyghens,** CHRISTIAAN, 1629–1695. Dutch mathematician, mechanician, astronomer, and physicist. In 1655 he hit upon an improved method of grinding lenses for telescopes, which led to the discovery of a new satellite of Saturn and the true nature of his rings. He was the first to apply the pendulum to the regulation of clocks, and was especially noted for his work in physical optics. His solution of the problem of the center of oscillation formed an important event in the history of mechanics. *Horologium Oscillatorium*, 1658; *Cosmotheoros.*—His father, CONSTANTIN, 1596–1687, a high official, pub. *Otia*, 1625, *Korenbloemen*, 1658–72, and other poems.

**Huygens' Principle.** The disturbance at any point of an elastic medium at any instant is that due to the superposition of all the disturbances which have reached it at that instant from the various surrounding parts of the medium. This was first enunciated by Huygens in 1678, and on this basis he was able to explain how the wave theory of light accounts for ordinary reflection and refraction.

**Huysmans,** CORNELIS, 1648–1727. Landscape painter of the Flemish school. He lived at Antwerp, Mechlin, and Brussels, and his best pictures are scenes in the forest of Soignies in



The Ravine, by Huysmans.

the vicinity of the latter city. He has fine works in the galleries of Antwerp, Berlin, Cassel, Dresden, Edinburgh and Glasgow.

**Huysmans,** JORIS KARL, b. 1848. French realistic novelist.

**Huysum,** JAN VAN, 1682–1749. Dutch painter of fruit and flowers.

**Hvitfeld,** ARILD, 1549–1609. Biographer of Danish kings.

**Hwen Tsang,** ab. 605–664. Buddhist monk of Chinese birth, who traveled in India 629–44. The account of his travels was completed 648.

**Hyacinth,** or JACINTH. Several varieties of gem stones, among them sapphire, garnet, vesuvianite, and zircon, have been known at different times by this name. The modern hyacinth is mostly a yellowish or orange-colored zircon, shading a little into brown.

**Hyacinth.** *Hyacinthus orientalis.* Showy-flowered, bulbous herb of the Lily family, native of w. Asia and extensively cultivated as an ornamental plant in numerous varieties and forms.

**Hyacinth,** WILD. *Quamassia hyacinthina.* Bulbous herb of the Lily family, native of the s. central U. S.

**Hyacinthe,** PERE (CHARLES LOYSON), b. 1827. French preacher, famous for eloquence. Orig. a Dominican and then a Carmelite, he left the R. C. Ch. 1869, married 1872, and since 1878 has had a Gallican Ch. in Paris. *Catholic Reform*, tr. 1874; *Conferences*, tr. 1879.

**Hyacinthus.** Youth beloved by Apollo, but struck by his quoit and killed on the spot. From his blood sprang the flower hyacinth, with *ai ai*, the exclamation of woe, on the leaves.

**Hyades.** Nurses of Dionysus, changed to the constellation Taurus; also called The Rainers from the ancient notion that their heliacal rising indicated the approach of wet weather.

**Hyænidæ.** Family of *Æluroidea*, having non-retractile claws, four-toed feet, rough tongue, vertical pupil, bushy tail, coarse fur, with a bristling mane and dorsal crest. The carnassial teeth are very powerful. Hyenas are more or less nocturnal in habit, and live principally upon dead animals. They

Striped Hyena.

range over the desert regions of the Old World. Their hinder legs and rump are less powerfully developed than the front legs; the neck is long. The Spotted and Brown Hyenas are confined to s. Africa; the Striped Hyena is found also in s. Asia.

**Hyaline** (or VITREOUS) **Foraminifera.** Those whose shells, though formed of carbonate of lime, appear clear and glassy.

**Hyalite.** Variety of opal, usually glassy and colorless, occurring in concretions or crusts with rounded surfaces, and resembling a hardened gum. Also called Muller's Glass.

**Hyalography.** Process of etching on glass by means of hydrofluoric acid. An etching ground of guttapercha is laid over the glass object to be etched. The design is cut through the ground with an etching needle, and a wall of guttapercha built about it to confine the acid. The ground should be spread over a considerable portion of the plate or object, as the fumes of the acid are heavy, and, falling upon the material, will give it the appearance of ground glass. It is used only for decorative purposes. See ETCHING ON GLASS.

**Hyalonema.** Glassy sponge of the family *Hexactinellidæ*. It anchors itself to the bottom by a rope of glassy threads.

**Hyalophane.** $(K_2,Ba)Al_2Si_4O_{12}$. Monoclinic feldspar, containing barium in considerable quantity.

**Hyaloplasm.** Clear non-granular protoplasm of cells; that in which the chromatin granules lie imbedded; hence properly achromatic.

**Hyalospongia.** *Hexactinellidæ.* Sponges with a skeleton composed of a firm lattice work of six-rayed silex spicules, as in *Euplectella* (Venus's Flower-basket), and other glassy sponges, mostly deep-sea forms.

**Hyatt,** ALPHEUS, b. 1838. One of the founders of the Peabody Academy of Sciences, and its curator 1869; custodian and curator of the Boston Society of Natural History, and Prof. of Geology and Paleontology in Mass. Inst. of Technology 1881. His chief work has lain among the fossil *Cephalopoda.*

**Hybodus.** Genus of shark-like fishes, characteristic of the Mesozoic, having two dorsal fins and spines, and large, crushing

Tooth of Hybodus.

Fin-Spine of Hybodus.

teeth covering the working borders of the mouth like a pavement; allied to the modern Port Jackson Shark (*Cestracion*).

**Hybrid.** Offspring of the fertilization of one species of animal or plant by another, as the mule, a cross between the horse and the ass, and many cultivated garden plants, as *Verbenas*. Two sorts of hybrids can theoretically be produced between any two species, the father of one with the mother of the other, and the father of the second with the mother from the first. Hybrids are usually sterile.

**Hybridization.** Fertilization of a plant or animal by male protoplasm from one of a different species; production of hybrids. This depends upon obscure conditions. Some species and even genera cross easily, others not at all. Of those that are interfertile, the cross may be reciprocal or may be only one way. Certain individuals of a species may interbreed, others not. Some are prepotent above their fellows. Fertility also varies with conditions of life; captive animals rarely breed even within their own species.

**Hydaspes.** River in India, now the Behat or Ghelum, on whose banks was fought the decisive battle between Alexander and Porus, 327 B.C.

**Hydatid.** Membranous sac lodged in the tissues; due to the presence of parasites, *e.g.*, echinococci of tapeworms; or representing rudimentary organs, as those occurring in connection with the reproductive glands.

A, brood-capsule of *Echinococcus veterinorum*, with fully-formed and rudimentary heads; B, adult *Tænia echinococcus*.

**Hyde,** ANNE, 1637–1671. Daughter of Lord Clarendon; married 1660 to the Duke of York, afterward James II., mother of queens Mary and Anne.

**Hyde,** EDMUND MORRIS, Ph.D., b.1856. Prof. Latin, Lehigh Univ., 1889.

**Hyde,** EDWARD. See CLARENDON, LORD.

**Hyde,** THOMAS, D.D., 1636–1703. Librarian of the Bodleian 1665–1701; Archdeacon of Gloucester 1678; Prof. of Arabic at Oxford 1691, and of Hebrew 1697; eminent as an Orientalist; historian of the ancient Persian religion 1700. He superintended the printing of a Malayan translation of the four Gospels. *Works*, 1767.

**Hyde Park.** In Westminster, London. It covers 390 acres,

Hyde Park and the Serpentine.

has 9 entrances for carriages, contains an ornamental sheet of water called the Serpentine, and is frequented by all classes.

**Hyde Park.** Suburb of Boston, Mass., on the Neponset. Pop., 1890, 10,500.

**Hyderabad,** or HAIDARABAD. Walled city of s. central India, capital of the Nizam's dominions; founded 1589; 390 m. n.n.w. of Madras, and 1,700 ft. above the sea. Pop., 1891, 312,390.

**Hyder Ali,** ab. 1728–1782. Virtual ruler of Mysore 1759. He was successful in military operations, extending his sway and loosing the hold of the Mahrattas on Mysore; warred against the British 1767–69, and made peace on his own terms; sided with the French 1780, and invaded the Carnatic. See DIAMOND.

**Hydra.** Monster with nine heads, which lived in an Argive swamp and ravaged the country. When Hercules struck

Hercules killing the Lernian Hydra, by Floris, 1520.

off one head, two sprang up in its place. He overcame it by burning away the heads, and used its bile to poison his arrows.

**Hydra.** Fresh-water polyp; small sac-shaped organism, which can attach itself by the aboral end. Six to nine tentacles are present encircling the oral end. The green hydra is frequently found branched, by means of several buds, themselves budding before they become detached.

**Hydracids.** See ACID.

**Hydracrylic Acid.** $CH_2OH.CH_2.COOH$. $\beta$-Hydroxypropionic acid; thick syrup, made by treating $\beta$-iodopropionic acid with silver oxide.

**Hydractinidæ.** Family of *Tubulariæ*, of which *Hydractinia* is the type. This hydroid forms an incrusting, moss-like colony on the shells inhabited by Hermit Crabs. Some of the polyps are nutritive; others are without tentacles, and bear the gonophores, male or female. Other members of this family have, in addition, the spiralzoöids.

**Hydragogue.** Agent which promotes the discharge of watery stools or of large amounts of urine of low specific gravity.

**Hydrangea.** Genus of showy-flowered shrubs of the Saxifrage family, natives of Asia and N. America, much planted for ornament.

Hydrangea hortensis

**Hydrant.** Hollow post, connected to a water main, through which a large stream of water can be discharged. It should be able to deliver ab. 2,000 gallons per minute under a head of 200 feet, in order to furnish an effective fire stream.

**Hydranth.** Nutritive zoöid, or that part of a hydroid colony which carries the mouth and stomach.

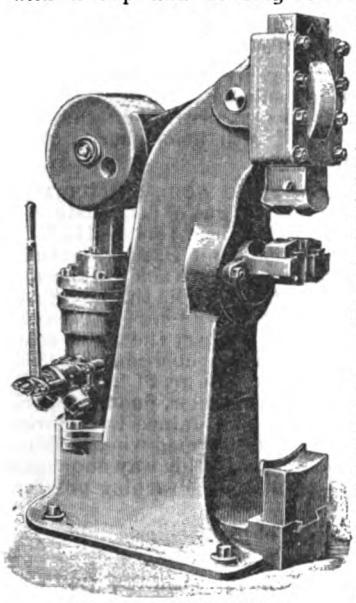
**Hydrastine.** $C_{21}H_{21}NO_6$. Mpt. 135° C. Alkaloid, obtained from the root of the Golden Seal; colorless crystals, extracted from the root by ether; used in pharmacy on account of its numbing effect upon the mucous membrane. See BERBERINE.

**Hydrates.** Obsolescent name for HYDROXIDES (q.v.). It is still used to indicate compounds containing water of crystal-

lization or composition, which can be driven off by heating; *e.g.*, chlorine hydrate, $Cl_2+10H_2O$; sulphuric acid hydrate, $H_2SO_4+H_2O$.

**Hydra-Tuba.** Medusoid polyp, which develops from the egg and later produces the scyphystoma and strobila stages in jellyfish like *Aurelia*.

**Hydraulic Buffer.** Device for checking the recoil of heavy guns after being fired. It consists of a wrought-iron or steel cylinder, closed at one end, the other being fitted with a cup and stuffing-box through which a piston-rod passes. The piston is perforated with several small holes, and the cylinder is partly filled with oil or water, and securely attached to the platform. When the gun is discharged the carriage, to which the end of the piston-rod is attached, forces the liquid through the piston holes, and thus gradually brings the gun and carriage to rest.



Hydraulic Veeing Machine.

**Hydraulic Cement.** See CEMENT, CEMENT TESTS, and HYDRAULIC LIMESTONE.

**Hydraulic Forging.** Process of forging metals in which the operations are performed by pressure (instead of percussion) produced by suitable hydraulic presses. See HYDRAULIC PRESS. This method is specially useful for work in dies, and for butt-welding, flanging, and upsetting. The pressure is maintained by means of an ACCUMULATOR (q.v.); in some large plants two of them are used, the one with lighter load filling the press chamber, and the heavier one being connected to the latter only when it is filled. A notable saving in pumping power and in time is thus effected. Pressures as high as 2,500 lbs. to the sq. in. are in use for the heavier accumulator. Hydraulic forging processes do not expel cinder from welded metal as well as hammers, nor do they restore impaired density to the bar as well as percussive processes. See FORGING OF METALS.

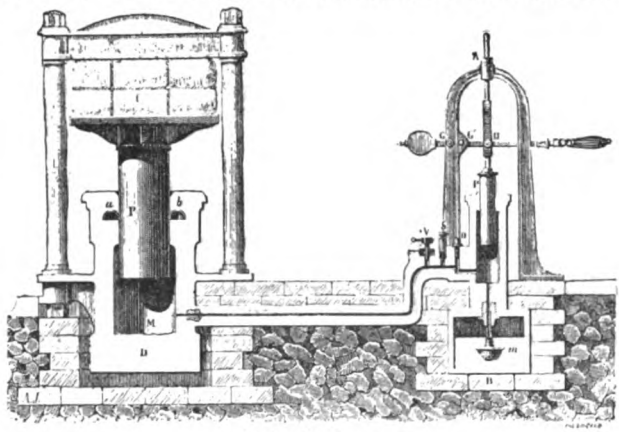
**Hydraulic Gradient.** Line to which the water in a main will rise, if tubes be inserted into it at different points; or free surface of water flowing in an aqueduct. A water main should never be laid above this gradient, as it then becomes a partial siphon and the flow is impeded.

**Hydraulic Jack.** Portable hydraulic press, by which heavy objects can be lifted.

**Hydraulic Limestone.** Impure limestone containing magnesia and clay, in varying proportions, which yields on burning a cement that sets under water. In the U. S. in 1894 nearly 8,000,000 barrels, of 300 pounds each, of hydraulic cement were made from natural stone. The principal points of manufacture in the U. S. are in Ulster co., N.Y., and in the vicinity of Louisville, Ky., though considerable quantities are produced in several other districts.

**Hydraulic Mining.** See GOLD, METALLURGY OF.

**Hydraulic Press.** One of the elementary machines, which consists of two chambers, in each of which fits a plunger, fluid-tight, in a stuffing-box. The two plungers are of different area, and the chambers are connected by a pipe, in which is a valve opening outward from the smaller plunger chamber. If now the two chambers are full of fluid, and the area of the smaller plunger be assumed at one sq. inch, a given pressure on the free end of that small plunger will produce a fluid pressure in the vessel of that number of pounds per sq. inch. On the bottom of the larger plunger also this same pressure per sq. inch will be exerted, and it will be forced outward, unless held back by a pressure which is as much greater than that on the small plunger as the area of the large plunger is greater than the area of the small one. The smaller is usually a pump-plunger; to secure steadiness of motion for the resistance three of them are often put on cranks at 120°. Often also, to equalize the effort, as resistance increases in gradual compressions, the lever arm of the pump is made to grow less by means of a slider in a link. As in the lever, the path of the small plunger is as much greater than that of the ram as the area of the latter is greater than the area of the former. In what has been called the sterhydraulic press, the displacement of the fluid is given by coiling a round band around a drum inside the chamber, the



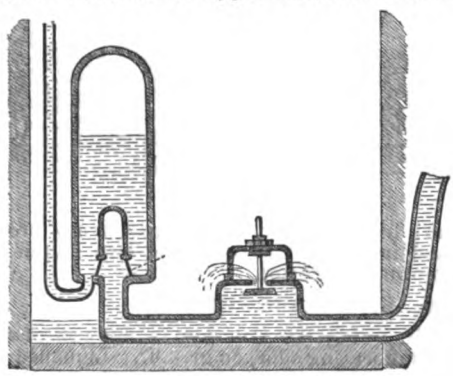
Hydraulic Press.

band being drawn in from outside through a stuffing-box. It is sometimes called Hydrostatic Press. See BRAMAH PRESS.

**Hydraulic Radius.** Area of the cross-section of a conduit, divided by the length of its wetted perimeter. The hydraulic radius of a circular section is one-fourth its diameter.

**Hydraulic Railway.** One on which cars are propelled by the impulse of water against vanes attached to them, the water being supplied through nozzles attached to a pipe laid between the rails; the cars are supported upon hollow shoes, between which and the rails a film of water is forced from the cars. A short experimental line was exhibited at the Paris Exposition of 1889.

**Hydraulic Ram.** Machine for raising water to heights by means of the living force of that water as its flow is arrested suddenly in a descending closed channel; invented by Montgolfier, 1796. When a column of water flowing by gravity in a pipe through an opened valve is suddenly arrested by the closure of that valve, a water-hammer is observed. The flowing water in the pipe has a certain living force, due to its motion, and this is given out, especially at the closed end of the pipe, to exert a considerable strain there. That pressure is sufficient to open a valve in a column pipe, which valve is held down by the head of water on its upper side, and to allow some of



Section of Hydraulic Ram.

the arrested water to force its way into the filled column. The water being at rest, when equilibrium is restored, the first valve can be made to open and re-establish the flow. This is done by having the first valve a check-valve seating upward, and so weighted in proportion to its area as to fall open by its own weight when the descending fluid is at rest, but in the moving current flowing through the opening it will be floated shut and stop the flow. The establishment of the flow is the occasion of waste by leakage, but ordinarily, under average lifts, these rams will lift ab. one-third of what flows in the actuating current.

**Hydraulics.** Science which sets forth the laws and phenomena of flowing water. The first law was announced 1638 by Torricelli, that the velocity of flow through an orifice in a vessel was the same as that due to a fall from the free surface to the orifice. Investigators and experimenters in the 18th century were Newton, Michelotti, Borda, Bossut, and Du Buat; they laid the foundation for a true science by determining the resistance to flow through orifices, pipes and channels. In the 19th century this work has been greatly extended by Eytel-

wein, Weisbach, Darcy, Bazin, Francis, and others. The science, in fact, is more largely experimental than theoretical, on account of the very great influence of frictional resistance. The subdivisions of hydraulics are the pure theory of the motion of water under the action of gravity, and its practical flow through orifices, over weirs, in tubes, pipes, conduits, canals, and rivers. The measurement of water and water power, its dynamic pressure due to change of direction, and the utilization of its energy by means of water-wheels and turbines, are examples of important practical applications.

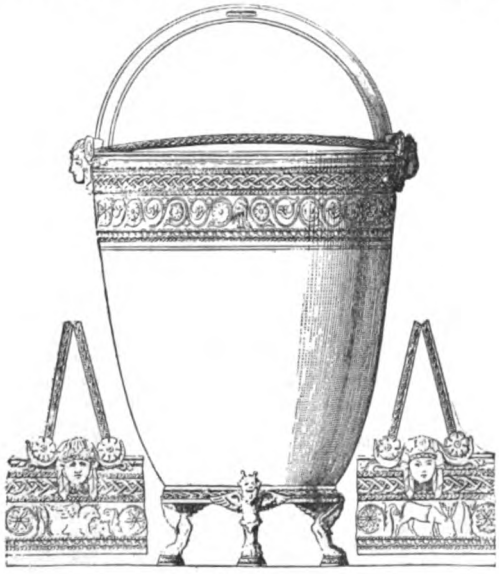
**Hydraulic Tourniquet.** This instrument, when made on a large scale, is sometimes known as BARKER'S MILL (q.v.).

**Hydrazines.** Bases derived from the compound diamide or hydrazine $NH_2.NH_2$, by replacing the hydrogen in one of the $NH_2$ groups by a hydrocarbon radical. Thus $C_6H_5NH.NH_2$ is phenyl hydrazine, the most important one.

**Hydrazobenzene.** $C_6H_5.NH.NH.C_6H_5$. Colorless crystalline compound, produced by the reduction by hydrogen of azobenzene. It passes with great ease into benzidine, which is prepared technically in this way.

**Hydrazoic Acid.** $HN_3$. Frightfully explosive compound, discovered by Curtius; made by passing nitrous oxide over sodium amide. Its metallic derivatives, especially those of lead and silver, bear a striking resemblance to the corresponding chlorides.

**Hydria.** Water-jar used by the ancients as a stationary store of drinking water, as it was too large to be carried to the



Hydria.

spring. The illustration shows a fine specimen of bronze richly embossed and inlaid with silver. The two handles fall back and form an ornamental rim.

**Hydrida.** See ELEUTHEROBLASTICA.

**Hydriodic Acid.** HI. Colorless fuming gas, of strong acid reaction and suffocating odor, sp.gr. 4.37. Liquefied —17.8° C., 2.9 atm.; solid —55° C. The solution in water is very unstable; the strongest which can be prepared has a sp. gr. of 1.99. It is made by treating phosphorous triiodide with water, or by passing hydrogen sulphide into water containing finely pulverized iodine in suspension.

**Hydrobromic Acid.** HBr. Sp.gr. 2.7. Colorless, strongly fuming gas, of an irritating smell and acid taste, condensing at —73° C. to a colorless liquid; solid at —100° C., very soluble in water, to sp.gr. 1.78, being used as a reagent; made by treating phosphorus and bromine with water; similar to hydrochloric acid, but not as stable.

**Hydrocarbon Oil.** Liquid consisting of a mixture of hydrocarbons, usually oils obtained by the distillation of crude petroleum or bituminous shales.

**Hydrocarbons.** Compounds consisting of carbon and hydrogen, *e.g.*, $H_3C.\overset{H_2}{C}.CH_3$; solid, liquid, or gaseous, according as they contain many or few carbon atoms in the single molecule.

**Hydrocaulus** (HYDROPHYTON). Part of a hydroid colony intervening between a hydranth and the hydrorhiza.

**Hydrocele.** Collection of watery fluid in a cyst or confined to a natural cavity or space of the body: more particularly, such accumulation in the scrotum or spermatic cord, forming an elastic and usually painless swelling, relievable by operation or bandaging.

**Hydrocephalus.** Water on the brain; accumulation of fluid within the skull, which may be sufficient to cause enlargement of the head and produce serious effects by pressure upon the brain. It occurs most frequently in young children, is usually due to tuberculosis, and rarely curable: it is not often seen, what is commonly so called being an infiltration of the brain with a watery fluid, which occurs in diarrhœa and other wasting diseases in infants and young children.

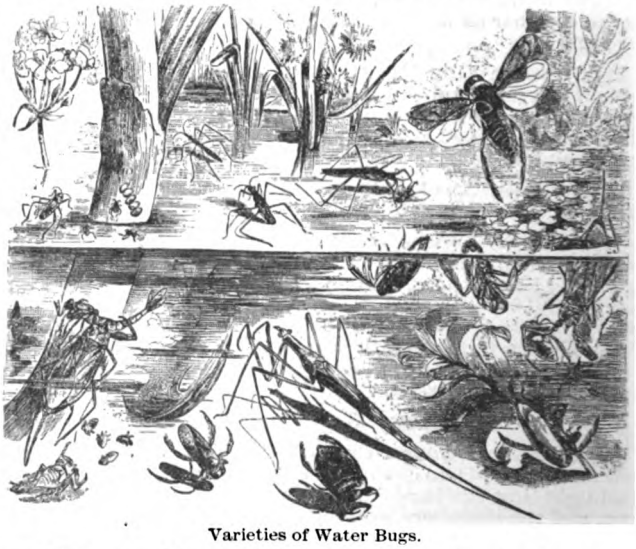
**Hydrocharitaceæ.** Natural family of aquatic flowering plants, of the class *Angiospermæ*, sub-class *Monocotyledons*, comprising 14 genera and ab. 40 species, distributed through the temperate and warmer lands of both hemispheres, commonly called the Frog's-bit family.

**Hydrochloric Acid,** CHLORHYDRIC ACID, or MURIATIC ACID. HCl. Colorless, strongly fuming gas of acid taste and irritating odor; sp.gr. 1.26. Liquid 10° C., 40 atm.; solid—115.7° C. It was known to the Arabian alchemists, but Basil Valentine, 15th century, was the first to mention the pure acid. It occurs in the exhalations of volcanoes, and is found in the intestinal juices. It is very soluble in water; at ordinary temperatures 450 volumes are dissolved by one volume of water; the water solution is the article of commerce. The strongest acid contains 43.09 per cent of the compound HCl, and has a sp. gr. of 1.22 at 0° C. The commercial acid always has a yellow color, due to impurities of organic matter and iron. It is obtained in factories where sodium carbonate is made, being formed when sodium chloride is treated with sulphuric acid. In this way enormous quantities are made. It is used in making bleaching powder. See CHLORINE.

**Hydrochlorides.** Derivatives of hydrochloric acid. The term is obsolescent, and is being replaced by Chlorides.

**Hydrocoralliæ** (HYDROCORALLINÆ). Coral-like hydroid stocks with calcareous cœnenchyma. The corallum is hollow and opens by two sizes of pores: the larger contain the nutritive polyps, having mouth, stomach, etc.; the smaller bear dactylozoöids, which have tentacles but no mouth. The *Millipores* are examples.

**Hydrocores,** or HYDROCORISÆ. Water-bugs. Tribe of *Hemiptera*, including bugs having short antennæ of three or



Varieties of Water Bugs.

four joints, sometimes hidden from view, and a short rostrum. They feed on animal juices.

**Hydrocyanic Acid.** HCN. Sp. gr. 0.70, bpt. 26° C. Prussic acid; colorless liquid of bitter almond odor, prepared by the action of sulphuric acid on potassium ferrocyanide. The potassium cyanide is made by heating the ferrocyanide, and is also one of the most violent poisons known. A grain of anhydrous acid has produced death in 20 minutes. Discovered by Scheele, 1782.

**Hydrocysts.** Feelers of the *Physophoridæ;* curious processes of the cœnosarc, like nematophores.

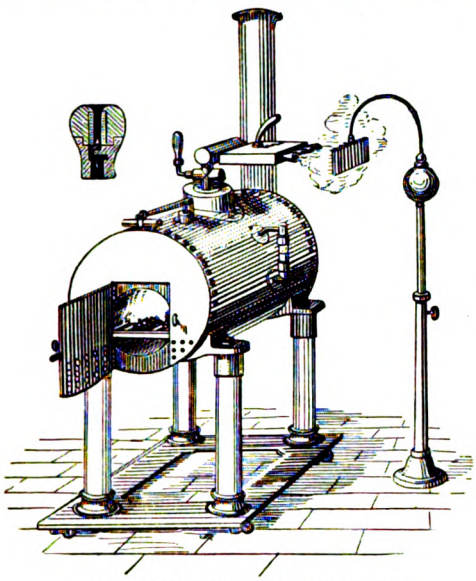
**Hydrodictaceæ.** Order of green *Algæ*, inhabiting fresh water; commonly known as water-nets, from their reticulated structure.

**Hydrodynamics.** Subdivision of the study of DYNAMICS (q.v.), which treats of the action of fluids in motion under impressed forces; also called the mechanics of fluids. It concerns itself with flow of fluids through orifices, friction of fluids, impact of fluids, reaction, etc., and the motor machines using water as the source of power.

**Hydrœcium.** Chamber into which the cœnosarc of the *Calycophoridæ* can be retracted.

**Hydro-Electric Battery.** Any device for the purpose of producing electrical energy by means of chemical action.

**Hydro-Electric Machine.** Device for generating electricity by the passage of water vapor through narrow orifices. The fact was accidentally discovered by a workman. Sir W. Armstrong, while investigating the phenomenon, ascertained that the vapor was positively charged, and that the vessel from which it issued, if insulated, was negatively charged. Faraday afterward found out the cause of the action; viz., the



Armstrong's Hydro-Electric Machine.

friction of the condensed water against the cooled steam nozzles. It was found that the form and material of the jet had an important effect on the result. The machine consisted of a small steam boiler, insulated on four glass legs and having a line of jets at the top. Opposite the jets was placed a prime conductor, also insulated, and furnished with a set of metal points, against which the steam rushed, thus parting with its positive charge.

**Hydroferricyanic Acid.** $H_3Fe(CN)_6$. Crystalline solid obtained by treating potassium ferricyanide with concentrated hydrochloric acid.

**Hodroferrocyanic Acid.** $H_4Fe(CN)_6$. White crystalline solid, soluble in water and alcohol; made by treating potassium ferrocyanide with concentrated hydrochloric acid.

**Hydrofluoric Acid.** HF or HFl. Colorless, strongly fuming liquid; bpt. 19° C., sp. gr. 0.98. The vapors, as well as the liquid, are very corrosive and produce serious wounds when in contact with flesh. It is made by treating fluorspar with sulphuric acid in lead or platinum vessels, is preserved in bottles made of wax, and is used for etching glass.

**Hydrogen.** H. At. wt. 1.008; sp. gr. .0692. Liquid at —211° C., 80 atm. Discovered by Cavendish in 1766; colorless, odorless, tasteless, inflammable gas, occurring to some extent in nature in the free condition, especially in natural gas; it also occurs in water and in almost all compounds of animal and vegetable nature. It is a constitutent of all acids, and to its presence the acid properties are due. It can be prepared in a number of ways; the simplest is to treat zinc or iron with hydrochloric or sulphuric acid. With oxygen it forms a mixture which explodes violently if ignited, producing water.

**Hydrogen Antimonide.** See ANTIMONIURETED HYDROGEN.

**Hydrogen Arsenide.** See ARSENIURETED HYDROGEN.

**Hydrogen Dioxide,** or PEROXIDE. $H_2O_2$. Sp. gr. 1.45. It is not frozen at —30° C. Clear, colorless liquid, resembling water in appearance; very unstable; powerful oxidizing agent; made by treating barium dioxide with sulphuric acid; used as a bleaching agent, in medicine, surgery and in the laboratory. It evolves 475 volumes of oxygen when warmed. Under the name of Golden Fluid, a solution of it is sold for bleaching the hair. $H_2O_2$ was discovered by Thenard, 1818.

**Hydrogen Phosphide.** See PHOSPHORETED HYDROGEN.

**Hydrogen Salts.** Various acids; *e.g.*, sulphuric acid, $H_2SO_4$, is hydrogen sulphate.

**Hydrogen Selenide.** See SELENIURETED HYDROGEN.

**Hydrogen Sulphide.** See SULPHURETED HYDROGEN.

**Hydrogen Telluride.** See TELLURETED HYDROGEN.

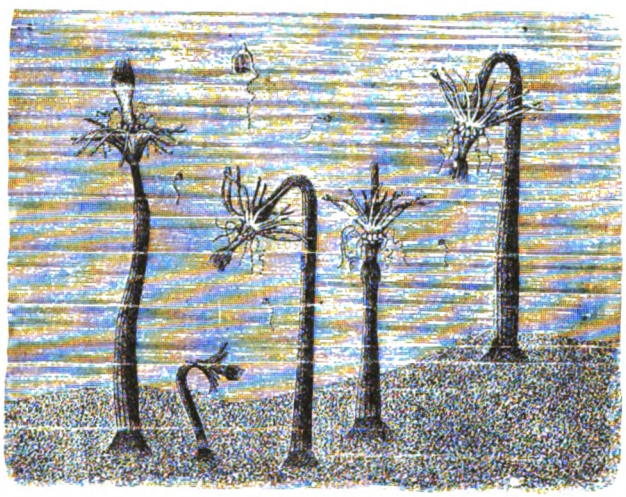
**Hydrogen Thermometer.** See GAS THERMOMETER.

**Hydrography.** Surveying and mapping of coast lines, harbors, and rivers, including soundings of depths, directions of currents, and other operations which will give the navigator a thorough knowledge of both the coast and the ocean bed. The common methods of surveying and triangulation are used for mapping the coast lines. In the U. S. this work, except for engineering improvements, is in charge of the Coast and Geodetic Survey of the Treasury Department. Maps of foreign coasts are prepared by the Hydrographic Office of the Navy Department.

**Hydroida.** Group of *Hydrozoa*, including *Hydrida*, *Corynida*, *Sertularida*, *Campanularida*, *Thecomedusæ*, and *Hydromedusidæ* (Acalephs). See HYDROMEDUSÆ.

**Hydrokinetics.** That branch of hydrodynamics which treats of liquids in motion. If a liquid be flowing through a channel completely bounded laterally, the quantity passing each cross-section during any given interval of time is the same. It follows from this that the velocity of flow at any point of the stream is inversely as the cross-sectional area at that point. This law is due to Leonardo da Vinci, and is known as the Law of Continuity. See DISCHARGE, COEFFICIENT OF; FLOW THROUGH AN ORIFICE; TORRICELLI'S LAW; CONTRACTED VEIN; HEAD; POISENILLE'S LAW; AJUTAGE.

**Hydromedusæ** (HYDROIDA). Colonial *Hydrozoa*, usually fixed, and giving rise to medusoid buds that carry the sexual cells. These buds may be set free as jellyfish having a velum, or be retained as rudimentary medusa-buds. The following



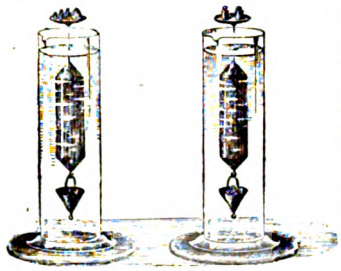
Hydromedusæ.

sub-orders are included: *Eleutherobtasteæ*, *Hydrocorallíæ*, *Tubulariæ*, *Campanulariæ*, *Trachymedusæ*, and *Thecomedusæ*. Some authors include the Siphonophores: this sub-class has also been termed the *Craspedota* and *Gymnophthalmata*.

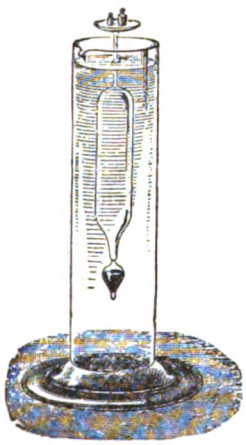
**Hydromedusidæ** (ACALEPHS). Now distributed into different groups, so that only a portion of the Acalephs or Jellyfish are here included. See ACALEPHÆ and HYDROMEDUSÆ. The terms *Hydrozoa* and *Polypomedusæ* include all the Acalephs and the Hydroids.

**Hydrometers.** Instruments for determining the specific gravity of a solid or of a liquid; of two classes, those of constant volume and variable weight, and those of constant weight and variable volume. Nicholson's Hydrometer is of constant volume. It consists of a hollow metallic cylinder with conical ends, at the bottom of which is suspended a kind of basket heavy enough to cause the instrument to float upright in water. From the top extends a short stem with a mark on it to which the instrument is always made to sink; at the

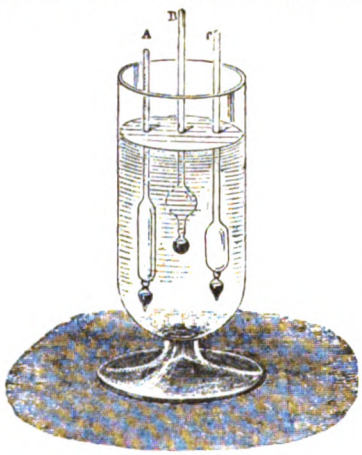
top of the stem is a little pan. Let w be the weight on the pan sufficient to sink the instrument to the mark on the stem, let $w_1$ be the corresponding weight if the body be on the pan, and $w_2$ if the body be in the basket immersed, then clearly $\int = \frac{w - w_1}{w_2 - w_1}$. Fahrenheit's is similar to Nicholson's, but is made of glass and is used for liquids. Instead of the basket at the bottom, there is a bulb of mercury or shot. If w be the weight of the instrument, and if $w_1$ grains sink it to the mark on the stem when in the water, and $w_2$ when in any other liquid, then $\int = \frac{w + w_1}{w + w_2}$. Hydrometers of constant weight and variable volume consist of a glass bulb partly filled with mercury and surmounted by a uniform graduated stem. They are usually employed to determine the degree of concentration of solution, and receive names—salimeter, ALCOHOLOMETER (q.v.), lactometer, saccharimeter, acidometer, vinometer, and urinometer—according as they are used to test solutions of salt, alcohol, milk, sugar, acid, wine, and urine. The zero of the scale is near the top if the liquid to be tested is heavier than water, near the bottom if it is lighter. Beaumé constructed an empirical scale for each case. In the former case the instrument sinks to zero in pure water at 12°C.; in a 15 per cent



Nicholson's Hydrometer.



Fahrenheit's Hydrometer.

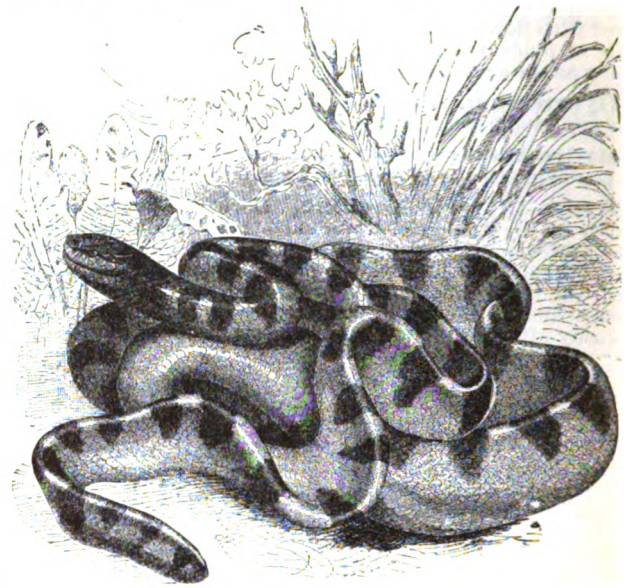



Forms of Hydrometers.

saline solution the point to which it sinks is marked 15, and on this basis the stem is graduated into equal parts. With this instrument $\int = \frac{144}{144 - N}$, where $\int$ is the density of any liquid heavier than water, and N is the reading from the scale. In the latter case it is made to read 0 in a 10 per cent saline solution, and 10 in pure water. In liquids of this sort $\int = \frac{128}{118 + N}$. In Twaddell's hydrometer the scale is not one of equal parts, but the divisions correspond to equal differences of density, and $\int = 1 + 0.005N$. $\int = \text{sp.gr.}$

**Hydropathy.** Treatment of disease by the application of water, externally to modify the action of the skin, internally for the purpose of washing out morbid products. Though similar methods have been employed ever since medicine has been studied, not until the close of the 18th century was any systematic use of water as a curative agent made. Even the beneficial results then proved by Wright, Currie, and Jackson failed to establish the treatment. Vincent Priessnitz, a farmer benefited by the use of water, founded the institution of Graefenberg, 1839, and began a movement which rapidly spread over Europe and in the United States. Truth has been much mixed with quackery, but the real advantages of water-treatment in the cure of certain affections are acknowledged by all.

**Hydrophidæ** (SEA SERPENTS). Family of *Proteroglypha*, living in the Indian Ocean and near adjacent shores. These snakes have a compressed fish-like body with paddle-like tail. The nostrils are on top of the snout and special valves are arranged to keep water out of them and the mouth. The ventral scutes are imperfectly developed. They are viviparous, grow to a length of eight or twelve feet, and fight furiously while in the water, but are helpless and blind when taken out, as in fish-



Striped Sea Serpent.

ermen's nets. Their chief enemies are Sharks and Rays. Their bite is instantly fatal to fish, on which they live, and very dangerous to man or large animals.

**Hydrophilidæ.** See PALPICORNIA.

**Hydrophilous.** Plants whose pollen is carried from the stamens to the pistils by water.

**Hydrophobia.** Disease of animals, particularly of the dog, wolf, fox, and cat, communicable from one to another and to man by inoculation with the saliva or tissues of any affected animal. It may occur at any time from ten days after the time of inoculation, usually by a bite, up to one year. It manifests itself by violent cramps of the muscles, especially those of the throat, which are apt to be aroused by the sight of water or food (there being no genuine fear of water as such), profuse flow of saliva, and mental excitement, often amounting to mania or delirium. Death results from paralysis of the muscles of respiration and exhaustion. No treatment is of avail save by inoculation with a substance derived by an attenuation of the virus, obtained from a diseased animal, made by a series of cultivations, a method introduced by Pasteur. By some the efficacy of this treatment is denied, but it probably is effectual if undertaken in time. Cauterization of the wounds inflicted by rabid animals, if thorough, will, as a rule, prevent the occurrence of the disease, which may be due to a specific micro-organism.

**Hydrophyllaceæ.** Natural family of flowering plants, of the class *Angiospermæ*, sub-class *Dicotyledons*, and series *Gamopetalæ*, comprising 17 genera and ab. 130 species, mostly confined to America; commonly called the Water-leaf family.

**Hydrophyllia.** Bracts of certain Siphonophores; leaf-like organs that protect the polypites.

**Hydrophyte.** Aquatic plants.

**Hydrophyton.** Common connecting stem uniting the zoöids of a hydroid colony.

**Hydroquinone.** $C_6H_4{:}(OH)_2$. Paradihydroxybenzene. Mpt. 169° C.; long colorless crystals, prepared by the oxidation of sulphanilic acid by chromic acid; powerful reducing agent, and used for this purpose in photography; easily oxidized to quinone.

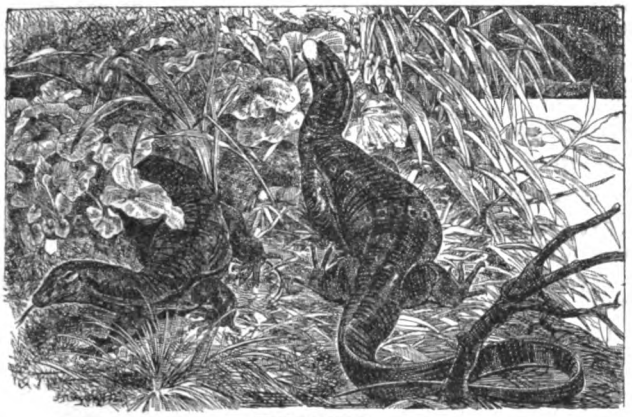
**Hydrorhiza.** Proximal end of a hydroid colony, which anchors it in the sand.

**Hydrosauria.** Aquatic Reptiles of large size, with teeth sunk in alveoli of the jaw. Two orders are included, ENALIOSAURIA and CROCODILIA (q.v.).

**Hydrosauria** (SYNAPTOSAURIA). Division of *Reptilia*, including the orders *Enaliosauria*, *Theromorpha*, and *Chelonia*. The group is characterized by the presence of paddle-like or webbed feet adaptive to an aquatic life, and the presence of one post-orbital bar, which is joined to the quadrate by a suture.

**Hydrosaurus** (VARANUS). Genus of monster lizards of

the family *Monitoridæ*, found in India, China and Australia. *H. salvator* attains a length of 8 ft. It inhabits India and is



Hydrosaurus.

there known as the Kabaragoya. *H. giganteus*, a species found in Australia, is known as Lace Lizard.

**Hydroselenic Acid.** See SELENIURETED HYDROGEN.

**Hydrosoma.** Entire organism of a hydroid colony.

**Hydrosphere.** Globe, with its liquid envelope; term recently introduced.

**Hydrospires.** Tubular and lamellar organs in Blastoids and Cystoids, that perhaps performed both a reproductive and a respiratory function. They open by one or more pores (spiracles) near the mouth and at other points.

**Hydrostatic Arch.** One so formed that its center line is a perfect curve of equilibrium under the pressure of water. For high heads of water this curve is a circle.

**Hydrostatic Balance.** Instrument for weighing bodies in liquids. It differs from the ordinary balance only in detail. Its pans are hung high, so that a solid suspended by a thread from the under side of one of them may be weighed while immersed in a beaker of water placed below.

**Hydrostatic Bellows.** Apparatus for producing a great upward pressure by the weight of a small column of water, in accordance with Pascal's law. A vertical hollow cylinder, extensible along its axis like a bellows, is filled with water through a small lateral tube opening into the cylinder near the bottom and reaching to some distance above its top. By standing upon the bellows and pouring water into the tube, a man may easily raise his own weight.

Hydrostatic Bellows.

**Hydrostatic Paradox.** See HYDROSTATICS.

**Hydrostatic Pendulum.** Appliance for measuring the velocity of flow of a liquid through a tube or other channel. The arrangement is such that when one end of the pendulum is fixed to the inner wall of the tube, the velocity of the stream is measured by the deflection of the free end from the vertical.

**Hydrostatic Press.** See HYDRAULIC PRESS.

**Hydrostatics.** That branch of statics which deals with fluids, and particularly with water, including the pressure upon submerged surfaces, buoyancy, centers of pressure and of buoyancy, and general conditions of stability of dams and gates. Archimedes was the founder of the science, and Galileo established many important principles. The law at the foundation of all hydrostatic phenomena is known as Pascal's Principle, that fluids transmit pressure equally in all directions. If the pressure throughout a fluid is due to its weight, then its value at any point is proportional, first to the depth of that point below the surface; second, to the density of the fluid. From this it follows that the pressure is independent of the shape of the containing vessel and of the quantity of fluid. Therefore it may happen that the total pressure upon the bottom of a vessel is greater than the weight of the liquid it contains, as when the bottom is much larger than the top; this is known as the Hydrostatic Paradox.

**Hydrosulphuric Acid.** See SULPHURETED HYDROGEN.

**Hydrotelluric Acid.** See TELLURETED HYDROGEN.

**Hydrotheca.** Chitinous cup which protects the hydranths in calyptoblastic hydroids.

**Hydrothorax.** Dropsy of the chest; accumulation of watery fluid in the thorax.

**Hydrotropism.** Curvature of rootlets toward moisture.

**Hydroxides.** Compounds derived from water, an element or radical replacing a portion of the hydrogen; *e.g.*, $KOH, NH_4OH$.

**Hydroxyacids,** or OXYACIDS. Acids containing not only the carboxyl group (COOH), or other acid radical, but also hydroxyl, OH, and therefore partaking not only of the nature of an acid, but also of that of an alcohol or phenol; *e.g.*, hydroxyacetic acid, $CH_2.OH.COOH$.

**Hydroxyaldehydes.** Substances containing an aldehyde group and a hydroxyl group, at once aldehydes and alcohols or phenols; *e.g.*, $HO.C_6H_4.CHO$, hydroxybenzaldehyde.

**Hydroxybenzoic Acids.** $HO.C_6H_4.COOH$. Oxybenzoic acids. For orthohydroxybenzoic acid, see SALICYLIC ACID. The meta- and para-acids are white solids of little importance.

**Hydroxyl.** Radical OH. Hydroxy or hydroxyl compounds are those containing this group; *e.g.*, $NaOH, C_2H_5OH$.

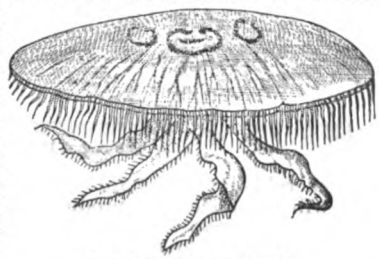
**Hydroxylamine.** $NH_2OH$. Hydroxyammonia. It crystallizes at low temperatures in extremely hygroscopic needles. Mpt. 33° C. It decomposes above 100° C. with explosion, is slightly soluble in chloroform, and is made by reducing nitric acid with tin and hydrochloric acid. The water solution has strong alkaline properties.

**Hydroxyl Compounds.** See HYDROXYL.

**Hydrozoa** (POLYPOMEDUSÆ). Cœlenterates without an œsophagus, and with no mesenterial septa dividing the gastrovascular cavity. They are generally branched forms, multiplying by budding and producing medusa buds, in which the sexual elements mature. They fall into the following orders: *Hydromedusæ*, *Siphonophora* and *Acalepha*, or sub-classes, according to some authorities, who also add the *Graptolitidæ*, *Hydrocorallinæ*, and *Stromatoporidæ*.

*a*, *Syncoryne frutescens* (reduced); *b*, branch of same (magnified); *c*, *Sarsia*, medusa of same, shortly after liberation.

**Hydrus.** Constellation of the s. celestial hemisphere constituted by Bayer and called the Southern Snake. It is situated between the s. pole and the bright star Achernar in Eridanus.



Aurelia aurita (reduced).

**Hyena Dog** (HUNTING DOG). S. African dog, resembling the hyena in absence of inner front toe, bushy tail, etc.; color brownish, with black and white patches. It hunts in packs, and is bolder than the wolf.

**Hyères.** Town of s. e. France, 13 m. e. of Toulon and near the sea; notable as a health resort; birthplace of Massillon. Pop., 1891, 8,300.

**Hygiea,** or HYGEA. Goddess of health; daughter or wife

Hygiea and Æsculapius.

of Æsculapius, represented as a virgin feeding a serpent from a cup. She had celebrated sanctuaries at Argos, Athens and

Corinth. She was sometimes conceived as the giver and protectress of mental as well as physical health, and therefore confounded with Athena.

**Hygiene.** Branch of medical science relating to the health and the best methods, both public and private, for its preservation.

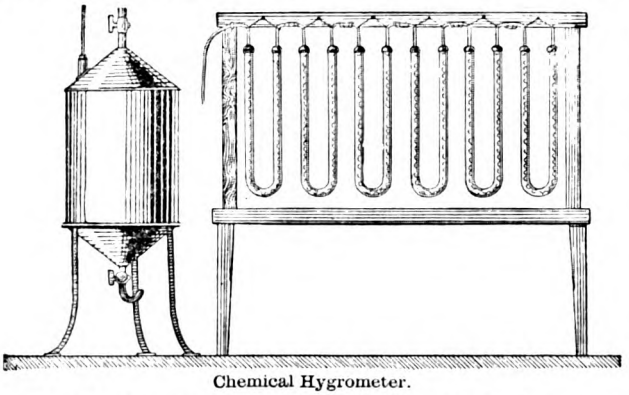
**Hyginus.** Roman critic and biographer of the Augustan age.

**Hygrometer.** Instrument for measuring the amount of moisture in the air. See HYGROMETRY.

**Hygrometric.** Movements of plants or their organs, induced by moisture.

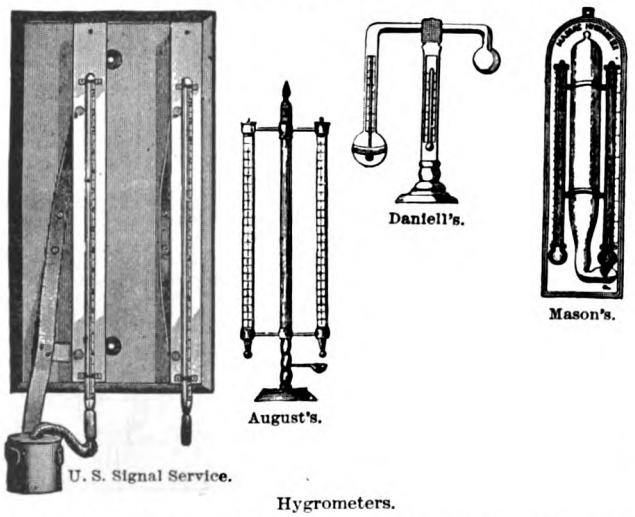
**Hygrometric State.** Called Relative Humidity. See HYGROMETRY.

**Hygrometry.** Science of measuring the amount of moisture in the atmosphere. The weight of the water vapor in a cubic meter of air at any time is its absolute moisture. When at any fixed temperature the addition of more vapor causes the condensation of some already present, or when any slight fall of temperature causes such condensation, the region is said to be saturated, and the vapor pressure is called the saturation pressure for that temperature. Under ordinary conditions the air is not saturated; the amount of vapor in one cubic meter compared with the amount it would take to saturate it at that temperature is called the relative humidity of the air. Evidently, if the air at temperature T° be comparatively dry, the dew-point will be low, *i.e.*, the temperature will have to be



Chemical Hygrometer.

considerably lowered before the small amount of moisture present will be sufficient to produce saturation. Hygrometers are of three classes; chemical, condensing, and psychrometers. The method employed in the first class is to pass a given volume of air through chloride of calcium tubes; the moisture is absorbed, and by weighing the tubes with their contents, before and after the experiment, the amount of vapor present may be determined from the increase of weight. This divided by the volume of air gives the absolute moisture. Condensing hygrometers are for the direct observation of the dew-point, by noting the temperature of a body artificially cooled until moisture just begins to be deposited upon it. Daniell's, illus-




Hygrometers.

trating this class, consists of an inverted U tube with a bulb at each end containing ether. In one of the bulbs is a thermometer, and on the outside of the bulb is a band of gold-leaf. The other bulb is covered with muslin, upon which may be poured a little ether. The cold produced by the evaporation from the muslin causes condensation of the ether vapor within this bulb, and a rapid evaporation from the ether in the other bulb takes place. This is gradually cooled down to the dew-point, which then may be read from the thermometer within the bulb the instant dew is seen on the gold band. See PSYCHROMETERS.

**Hygrophila.** See BASOMMATOPHORA.

**Hygroplasma.** Fluid portion of protoplasm.

**Hygroscope.** Instrument for detecting the presence of moisture.

**Hygroscopic.** Having a tendency to absorb or condense water vapor from the air.

**Hyksos.** See SHEPHERD KINGS.

**Hyla.** See DISCODACTYLIA.

**Hylæformia.** See DISCODACTYLIA.

**Hylaplesiformia.** See DISCODACTYLIA.

**Hylas.** Favorite of Hercules, carried off by the Naiads when he went to draw water, and long sought by Hercules in vain.

**Hylidæ.** See DISCODACTYLIA.

**Hylobates.** Genus of ANTHROPOMORPHA (q.v.) or man-like Apes inhabiting s.e. Asia and adjacent islands; commonly known as Gibbons. There are several species. They have arms so long that, when standing erect, the hands reach the ground. Small ischial callosities are present. *H. syndactylus* is noted as having a distinct chin; the index and middle toes are united by skin as far as the last joint. *H. agilis* is noteworthy as the only brute that can sing. During courtship it can sound the semitones of an octave both ascending and descending.

**Hylozoism.** Theory that all matter is in some way endowed with life, either in its elements or in the total mass of it known as the universe; characteristic of the earliest Greek speculation.

**Hymen,** or HYMENÆUS. God of marriage, invoked in the bridal song; represented as a youth bearing a bridal torch. Originally his name signified the bridal song itself, which was subsequently personified. Some poets call him the son of Dionysus and Aphrodite.

Hymen.

**Hymenium.** In Mycology, spore-bearing portions of certain ascomycetous and basidiomycetous *Fungi*.

**Hymenomycetes.** Order of *Fungi*, embracing the Mushrooms, Toadstools, etc., as well as the woody fungi and numerous smaller forms.

**Hymenophore.** Portion of a fungus that bears the hymenium, as the stipe of a mushroom.

**Hymenophyllaceæ.** Order of Ferns having very thin and delicate foliage; commonly known as filmy ferns; mainly of tropical distribution.

**Hymenoptera** (BEES and ANTS). Order of *Insecta*, including forms having biting or licking (suctorial) mouth-parts, with the thoracic segments fused, and two pairs of membranous wings, with few nervures. The metamorphosis is complete. The larvæ may be free, feeding on plants and having abdominal feet (six to eight pairs), or parasitic, or reared in cells and fed by special supplies of food, in which case they are grub-like and footless. Some undergo hypermetamorphosis, and some have a pseudo-pupa stage. There are two sub-orders, the TEREBRANTIA and ACULEATA (q.v.).

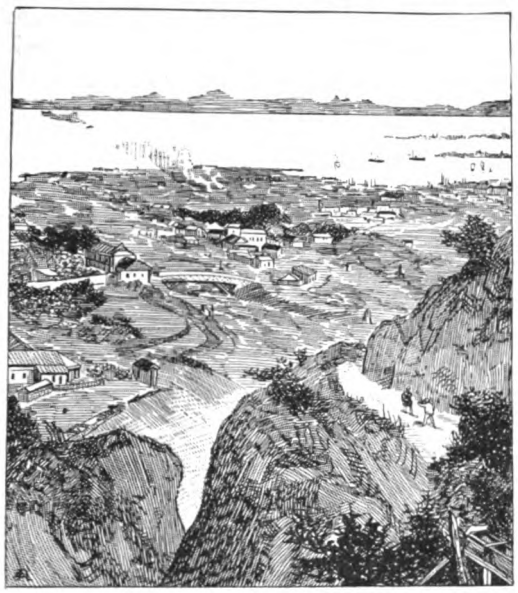
**Hymettus.** Mountain e. of Athens, famous for its honey, whose flavor is supposed to have been due to the wild thyme which grew there in abundance.

**Hymns.** In pagan times, poems in honor of gods and heroes; with us, songs of praise to God, or more loosely, religious lyrics in general. They came in with Christianity, and for centuries were abundant in Greek and Latin, as since the Reformation in Protestant countries, especially Germany. In England their production began late, but has been voluminous: the chief names are Dr. Watts and Charles Wesley, and in this century James Montgomery, Dr. J. M. Neale, and Dr. H. Bonar. In the U. S. Dr. Ray Palmer is the most eminent of many minor

writers. The entire field is covered in J. Julian's *Dictionary of Hymnology*, 1892.

**Hyndman,** HENRY MAYERS, b. 1842. English writer on Socialism.

**Hyogo.** Port in Honshiu, Japan, 16 m. w. of Osaka, on a bay adjoining that of Kobé, with which it forms one town;



Hyogo.

opened to foreign trade 1868. It has a fine climate, beautiful scenery and important trade. Pop. 104,000.

**Hyoid Arch.** Ring of bones lying between the mandible and the branchial arches of vertebrates.

**Hyoid Bone.** U-shaped bone in the throat, attached to the base of the tongue and upper part of the larynx.

**Hyoid Cleft,** or HYOMANDIBULAR CLEFT, or SPIRACLE. In front of the hyoid arch in fishes.

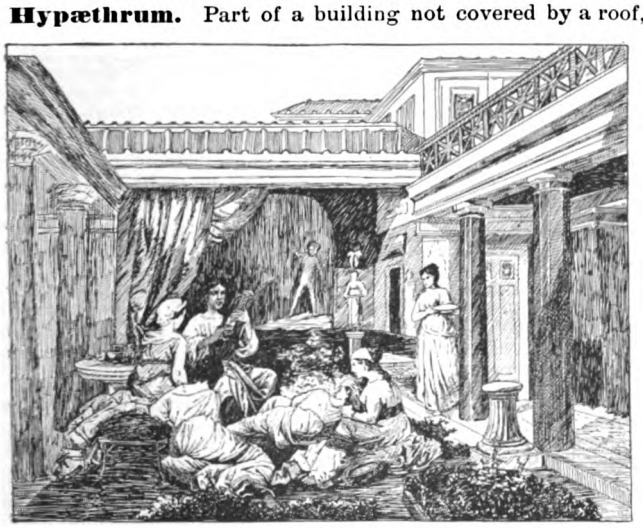
**Hyomandibular Bone,** or PHARYNGO-HYAL. Most dorsal piece of the hyoid arch in fishes. It becomes the stapes (ear-bone) in the higher vertebrates.

**Hyoscine.** $C_{17}H_{23}NO_3$. Amorphous alkaloid occurring with hyoscyamine in henbane, and having similar properties.

**Hyoscyamine** (DATURINE or DUBOISINE). $C_{17}H_{23}NO_3$. Crystallized alkaloid found in henbane, most in the seeds, in the seeds of *Atropa belladonna* and *Datura stramonium*, together with atropine, and in the leaves and twigs of *Duboisia myoporoides*. It is a narcotic poison, dilating the pupil of the eye.

**Hyostylic.** That mode of suspension of the mandible in fishes in which the hyoid alone furnishes the base of the suspensorium, as in nearly all fishes.

**Hypæthrum.** Part of a building not covered by a roof,



Pompeiian Hypæthrum.

as the central portion of an ancient Roman house. Hypæthral temples are arranged by Vitruvius under the seventh order, which had ten columns on each front and surrounded by a double portico.

**Hypanthium.** Receptacle of a flower when developed mainly or entirely below the calyx, as in many plants of the Rose family; known also as Hypanthodium. See SYCONIUM.

**Hypatia,** d. 415. Neo-platonic teacher of Alexandria, noted for beauty, learning, eloquence, and virtue; murdered by monks; celebrated in C. Kingsley's finest novel, 1853.

**Hyperæmia.** Increase, above the normal, of the amount of blood in a part.

**Hyperæsthesia.** Increase in the sensibility of a part.

**Hyperbola.** Conic formed by a plane cutting a right circular cone at an angle less than that made by an element. It is the locus of a point so moving that the difference of its distances from two fixed points (foci) is constant. See CONIC.

**Hyperbolas,** GENERAL. Curves whose equations have the form $x^m y^n = a$.

**Hyperbolic Functions** (IN ANALYSIS). Elliptic functions transformed to apply to arcs of the hyperbola.

**Hyperbolic Functions** (IN TRIGONOMETRY). Those derived from the cosine and sine of pure imaginaries and transferred as the hyperbolic functions of the real factor associated with the imaginary. Cosine $x\sqrt{-1} = \frac{\varepsilon^x + \varepsilon^{-x}}{2}$ and sine $x\sqrt{-1} = \frac{\varepsilon^x - \varepsilon^{-x}}{2}\sqrt{-1}$, where $x\sqrt{-1}$ is a pure imaginary and x is real. From these values, $\frac{\varepsilon^x + \varepsilon^{-x}}{2}$ is called the hyperbolic cosine of x (denoted by Ch. x) and $\frac{\varepsilon^x - \varepsilon^{-x}}{2}$ is called the hyperbolic sine of x (indicated by Sh. x). The other trigonometric hyperbolic functions, Tangent (Th), Cotangent (Cth·), Secant (Sch.), and Cosecant (Csch), are derived as corresponding simple functions from the sine and cosine. Anti-hyperbolic functions may be formed from these, as from the simple trigonometric functions.

**Hyperbolic Paraboloid.** Warped surface whose plane sections are parabolas or hyperbolas; formed by a straight line so moving as to touch constantly two fixed straight lines (directrices) and remain parallel to a fixed plane (director plane).

**Hyperbolic Space.** Conceived space in which the sum of the three angles of a plane triangle is less than two right angles.

**Hyperbolic Spiral.** Curve generated by a point moving along a revolving line in such a manner that the distance of the point from the pole varies inversely as the amount of revolution. Its equation is $\rho = \frac{a}{\theta + b}$ where a and b are arbitrary constants and ($\rho$. $\theta$.) the polar co-ordinates of the curve.

**Hyperboloid.** 1. Of one sheet. Solid generated by the movement of a variable ellipse parallel to a fixed plane having its vertices in two hyperbolas having a common conjugate axis, and being in planes perpendicular to each other and to the fixed plane. 2. Of two sheets. Same, except that the transverse axis of directing hyperbolas is common.

**Hyperboreans.** Ancient designation of the peoples living in Arctic regions. N. Siberia has several tribes, especially the Chuckchees. They are nomadic, fishermen, and herders of the reindeer, noted for their cruelty and abhorrence of a natural death. The aged are slain. See ALEUTS, ESKIMO, KAMCHATKA.—In ancient myths, race living beyond the n. wind in perpetual sunshine and perfect happiness.—In Botany and Zoölogy, plants and animals inhabiting the extreme north.

**Hyperdulia.** Differing only in degree from DULIA (q.v.).

**Hypereides.** Athenian orator and patriot, colleague and rival of Demosthenes, finally his opponent; executed by Antipater 322 B.C. Several of his orations have lately been recovered.

**Hypericaceæ.** Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Dicotyledons*, comprising 8 genera and ab. 240 species, widely distributed throughout the warm and temperate regions of the whole earth; sometimes included in the *Guttiferæ*.

**Hyperina.** Tribe of Amphipods with large head and large eyes. The pair of maxillipeds are rudimentary and form an under lip.

**Hyperion.** Titan, son of Uranus (Heaven) and Ge (Earth) and father of Helios (Sun), Selene (Moon) and Eos (Dawn). Homer uses Hyperion as a patronymic of Helios, and other poets confuse the two.

Hyperion.

**Hypermetamorphosis.** Form of metamorphosis, as displayed in *Sitaris*, where are several larval forms separated by pupa stages; the imago arises by a radical transformation of the tissues which have retrograded from the first larval condition. Hence a sort of second embryonic development takes place.

**Hyperoartia.** See PETROMYZONTIDÆ.

**Hyperodontidæ.** See ODONTOCETI.

**Hyperotreta.** See MYXINOIDÆ.

**Hyperspace,** or NON-EUCLIDEAN SPACE. That supposed in the higher analysis to have more than three dimensions. Forms having real significance in one, two, and three dimensions are carried forward to "n" dimensions and analogous general signification attached to them.

**Hypersthene.** $(Fe,Mg)SiO_3$. Orthorhombic mineral of the pyroxene group, essentially an iron, magnesium silicate, an ingredient in some eruptive rocks.

**Hypertrophy.** Increase in bulk of a part.

**Hyphæ.** Branched threads which make up the vegetative organs of *Fungi* and Lichens.

**Hyphasis.** River of India, now the Sutlej; limit of Alexander's march.

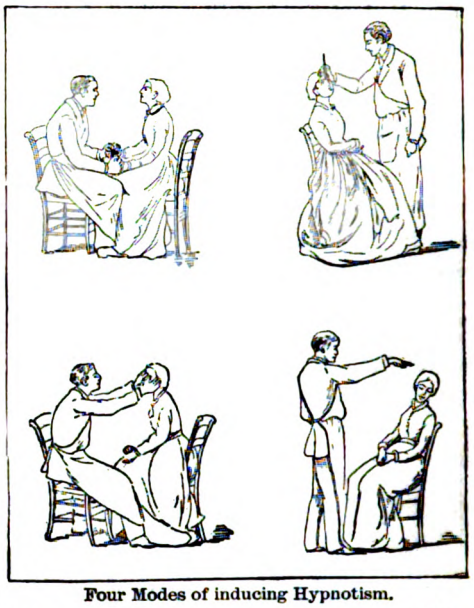
**Hyphomycetes.** Sub-class of *Fungi*, including many of the moulds.

**Hypnocyst.** Form assumed by certain *Protozoa* in the resting stage, when they encyst themselves for a short period and do not undergo any apparent change.

**Hypnosperm.** Reproducive body which undergoes a period of rest before germination, especially a certain small *Algæ*.

**Hypnospore.** Propagative body which undergoes a period of rest before development into a new plant; produced by certain *Algæ*.

**Hypnotism.** Science of the phenomena of hypnosis, a peculiar sleep-like state of body and mind, brought on in various ways and exhibiting many characteristic phenomena. The methods most in use for inducing the state are various means of holding the attention of the subject fixed and strained, *e.g.*, by fixed gaze on some bright object, by forced attention to a continuous sound, by a sudden loud sound, by a ray of bright light, by strokings of the skin, etc. Probably all these methods act by means of suggestion, *i.e.*, by calling up in the subject's mind the idea of the hypnotic sleep, since the same result can be brought about by a sharp command or series of commands directed to that end. The symptoms of the state are varied and striking. Among the most noticeable of the physiological symptoms are the anæsthesia or hyperæsthesia, as the case may be, of the senses, alterations of the function of muscular movement, *e.g.*, catalepsy and paralysis, apparent voluntary control to some extent over physical functions normally independent of the will, such as the circulation of the blood, etc. The intellectual functions also undergo changes in hypnosis, notably in the fields of attention and memory. The most characteristic and, according to the modern view, the most fundamental feature of the state is the subject's susceptibility to suggestion, which is apparently an extreme degree of the suggestibility normal to every one. On this factor and the obscure but characteristic phenomenon of rapport between the operator and the subject the main manifestations of the state appear to depend. Explanatory theories of hypnosis are, in the present stage of our knowledge, unsatisfactory. Perhaps the most promising line along which the physiological explanation may be found is indicated by the voluntary control of the circulation of the blood, and the consequent possible ability to alter the blood-supply of the brain in its various parts, allowing a concentration of energy in certain regions to the exclusion of others. Such a theory is however not only vague and open to most serious physiological and psychological objections, but unsupported by evidence of much value. The question of the value of hypnotism as a practical medical agent is much disputed. It seems, however, in the hands of careful operators, to be of considerable use in hysterical disorders.

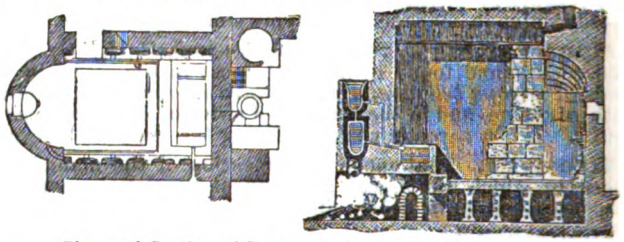

Four Modes of inducing Hypnotism.

**Hypoblast.** Innermost layer of cells of the embryo, that lining the lumen of the digestive tract.

**Hypobranchial Groove** (ENDOSTYLE). Ciliated furrow in the ventral part of the branchial sac of Tunicates, adapted for conveying food to the intestine, by means of secreted mucus which entangles small organisms brought in with the respiratory water. Ciliary action carries the mucus forward and upward to the dorsal lamina, whence it passes to the œsophagus.

**Hypocarpogean.** Fruits ripened in the soil.

**Hypocaust.** Subterranean furnace-room for heating Roman baths or villas by means of hot-air flues beneath the floors and up the walls. Such apartments are constantly found among the ruins of the country villas.


Plan and Section of Roman Bath, showing Hypocaust.

**Hypochilum.** Lower portion of the lip in certain orchids.

**Hypochlorin.** Substance extruded from chlorophyll granules under the action of hydrochloric acid or moist heat: it contains all the coloring matter of the grains, which remain as spongy masses.

**Hypochlorites.** Derivatives of hypochlorous acid, HClO, in which the hydrogen has been replaced by a metal.

**Hypochlorous Acid.** HClO. Unstable acid, of which Bleaching Powder, calcium hypochlorite, is the most important derivative. It is made by passing chlorine into water containing mercuric oxide in suspension. It is a good bleaching and oxidizing agent. See BLEACHING POWDER.

**Hypochondriasis.** Condition in which a person believes himself affected with some disease which does not exist, or is profoundly depressed and anxious without cause; undoubtedly a mental affection, but rarely followed by serious results. A hypochondriac is one thus affected.

**Hypocotyl.** Portion of a germinating stem below the cotyledons; also called the CAULICLE (q.v.).

**Hypocrateriform.** See SALVERFORM.

**Hypocraterimorphous.** See SALVERFORM.

**Hypocycloid.** Curve traced by a point on the circumference of a circle rolling without slipping on the inside of another circle. Such curves are much used for the flanks of gear-teeth, or the parts inside the pitch circle. See GEAR-WHEELS and EPICYCLOID. A special case of interest is when the rolling circle has a diameter one-half that of the circle within which it rolls. The hypocycloid is in this case a straight line coinciding with a diameter of the larger circle.

**Hypoderma.** Layer of cells immediately beneath the epidermis of plants; commonly composed of collenchyma cells.

**Hypodermis.** Active part of the skin of worms and other Invertebrates, by which the outer cuticular layer or shell is secreted.

**Hypogaeic Acid.** $C_{16}H_{30}O_2$. Mpt. 33° C.; obtained from peanut oil by the saponification of its glyceride, which is present in that oil. It is easily oxidized, and unites directly with bromine.

**Hypogene.** Strata of any age formed below the surface.

**Hypogenesis.** Form of Amphigenesis shown by the higher plants and animals, in which a single individual consists of a series of asexual links (metameres, etc.), and finally one or more of these units produces a generation of sexual cells that develop into new individuals, either continuously, as in Birds, Fishes, and Man, or by metamorphosis, as in Frogs. See STROPHOGENESIS.

**Hypognathous.** Birds having the lower mandible the longer.

**Hypogynous.** Stamens inserted on the torus of a flower, below the pistil, as in Flax; also disk of a flower situated entirely below the ovary.

**Hypohyal.** Inferior bone of the hyoid arch, connecting with the basihyal on the middle line, and with the ceratohyal above.

**Hypomere.** Base of a sponge in which the canal system is rudimentary, absent, or non-functional.

**Hypomycteri.** See FISSIPEDIA.

**Hyponastic.** Curvature resulting from greater growth on the lower side of a vegetable organ than on the upper.

**Hyponitrites.** Salts of hyponitrous acid, HNO(?), made by replacing the hydrogen by a metal.

**Hyponitrous Acid.** HNO(?). Obtained in aqueous solution by treating silver hyponitrite with hydrochloric acid, fairly stable. The hyponitrites are made by neutralizing the water solution with alkalies.

**Hypophalli.** Group of nematode worms, having no rod-like appendages.

**Hypopharyngeal Ridge** OF AMPHIOXUS. Structure corresponding to the ENDOSTYLE (q.v.).

**Hypopharynx.** Median projection on the inside of the lower lip (labium) of Insects.

**Hypophlœodal.** Structures or organisms occurring immediately beneath the bark.

**Hypophosphites.** Salts derived from hypophosphorous acid, $H_3PO_2$, by replacing the hydrogen with a metal. The most important are the calcium, sodium, and potassium hypophosphites, which are used in medicine.

**Hypophosphoric Acid.** $H_2PO_3$. Strongly acid liquid, formed with other acids when phosphorus under water is partially exposed to the air. The pure acid may be prepared by decomposing its lead salt suspended in water with hydrogen sulphide.

**Hypophosphorous Acid.** $H_3PO_2$. Well crystallized solid; monobasic; made by treating caustic potash with phosphorus, and decomposing the potassium salt thus formed with hydrochloric acid. It is a good reducing agent.

**Hypophysial Gland.** Curious organ in Tunicates, lying under the nerve-ganglion, and abutting on the branchial sac; comparable to the pituitary body of Vertebrates. A so-called olfactory tubercle lies at its end; the organ was once supposed to be olfactory in function.

**Hypopyon.** Collection of pus in the anterior chamber of the eye, due to inflammation of the cornea, from injury or infection.

**Hyporachis,** or HYPORHACHIS. Aftershaft or supplementary stem of a feather, joining the main shaft near the umbilicus.

**Hyposkeletal Muscles.** Those within or below the endoskeleton.

**Hypostome.** Proboscis, or that which carries the mouth, in hydroids; also the labium of arthropods.

**Hypostyle.** Covered colonnade or pillared hall. The hypostyle hall in the palace-temple at Karnac in Egypt is the most impressive example. The central columns, 12 in number,

Hall at Karnak.

are 62 ft. high and 11½ ft. in diameter; there are also 126 other columns. See EGYPTIAN ARCHITECTURE.

**Hyposulphurous Acid,** or HYDROSULPHUROUS ACID. $H_2SO_2$. Little known; made by treating sulphurous acid with zinc. It decomposes on standing in the air, yielding THIOSULPHURIC ACID (q.v.), then sulphur dioxide, sulphur, and water.

**Hypotenuse.** Side of a right triangle opposite the right angle. In the plane triangle its square is equivalent to the sum of the squares on the other two sides. In the spherical triangle its cosine equals the product of the cosines of the other two sides, or the product of the cotangents of the two oblique angles.

**Hypothecation.** In Civil Law, subjecting property to a claim by a creditor as a security for the debt, without parting with the possession, as in a pledge, or transferring the ownership, as in a mortgage.

**Hypothecium.** Layer of hyphæ in the thallus of Lichens or ascomycetous *Fungi*, immediately beneath the disk of the apothecium.

**Hypothesis.** Supposition made to explain known facts; as such can have only probability until it is verified. It is justified or abandoned when the results deduced from it by established laws agree with known truths or contradict them. —In Mathematics, given conditions in a theorem or problem.

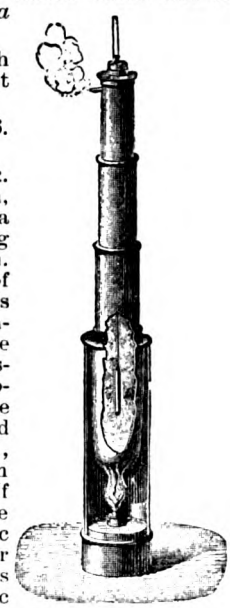
**Hypotrachelium.** In Classic Architecture, the molding or channel at the juncture of the shaft and capital in a column. In Mediæval Architecture it is called the Necking.

**Hypotricha.** Ciliates with convex naked backs and a flat ciliated ventral surface. *Oxytricha* and *Stylonychia* are examples.

**Hypozoic.** Rocks which lie beneath the fossiliferous strata and have as yet yielded no fossils.

**Hyppolite,** FLORVIL, ab. 1836–1896. Pres. Republic of Haiti 1890.

**Hypsometer,** or THERMOBAROMETER. Instrument first employed by Wollaston, and used to determine the height of a station above the sea-level by observing the boiling-point of water at the station. Thus the thermometer, used instead of the barometer for measuring heights, is very delicate and may be read to hundredths of a degree C. If approximate results only are desired, it may be assumed that the height is sensibly proportional to the difference between the observed boiling-point and 100° C., and Soret's formula may be employed; viz., $h=295(100-t)$, in which h is given in meters and t in Centigrade degrees. If more accurate results are desired, the boiling-point will give the atmospheric pressure by reference to a table of vapor pressures; then if $x_1$ and $x_2$ are the heights of two stations, $p_1$ and $p_2$ the atmospheric pressures, the difference in height will be given by the formula



Hypsometer.

$x_2-x_1=1{,}840{,}000(1+0{\cdot}00366t)\log\frac{p_1}{p_2}$, in which t is the mean of the two temperatures.

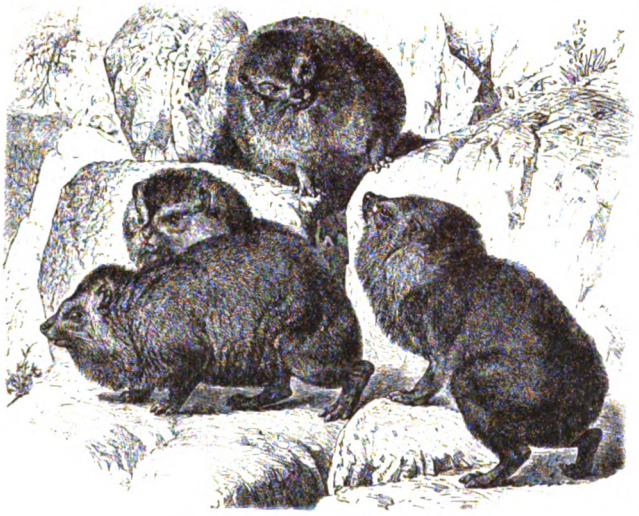
**Hypsometry.** Principles and methods for measuring elevations and heights, including the use of the barometer, the engineer's level, trigonometrical leveling by vertical angles, and other methods of less value.

**Hypsophyll.** Bract or leaf subtending a flower.

**Hypural Bones.** Those that support the tail-fin of fishes with homocercal tails: they represent hæmal arches.

**Hyracodont Dentition.** Form of molar teeth in which the tubercular ridges on the crowns are united by transverse ridges; a type standing between the tapirodont and trichechodont. The lower molars of *Hyrax* and Rhinoceros are examples. See ANTIODONT and LOPHODONT.

**Hyracoidea,** or LAMNUNGIA. Sub-order of *Taxeopoda*, represented by the living genus *Hyrax*, consisting of rabbit-like plantigrade animals, mostly African. One form, in Syria, is thought to be the Coney of Scripture. The nose is short, upper lip cleft, ears short, and tail rudimentary. The upper incisors grow from persistent pulps throughout life, as in Rodents. The mandibular condyle is transverse; there are no



Hyracoidea (*Hyrax abyssinicus*).

canines, and the lower incisors point forward. The molar teeth are like those of the Rhinoceros. The front feet are four-toed, the hind feet three-toed and furnished with hoof-like nails: the inner one of the *pes* is a true nail. Clavicles are wanting, and the placenta is deciduate and zonary. These animals were once classed with the perissodactyle Ungulates. *Hyrax capensis* of S. Africa is commonly known to the colonists as the Klipidas or Badger of the cliffs.

**Hyrcania.** Ancient mountainous region s. e. of the Caspian Sea, inhabited by wild nomadic races.

**Hyrcanus,** JOHN. I. King of the Jews 135–105 B.C.; son of Simon Maccabæus; for some years tributary to Syria, afterward independent; recognized by Rome 128. He took and destroyed Samaria 109.—II. His grandson, High-priest 78 B.C., King 69–66, Ethnarch 63–49, restored by Cæsar 47; prisoner in Parthia 40–33; executed by Herod, his son-in-law, 30.

**Hyrtl,** JOSEPH, 1811–1894. Hungarian anatomist; prof. Univ. Prague 1837, Vienna 1845–74.

**Hyslop,** JAMES, 1798–1827. Scottish poet. *Cameronian's Dream*, 1821. His works were pub. 1887.

**Hyslop,** JAMES HERVEY, Ph.D., b. 1854. Prof. Lake Forrest Univ. 1884–85, Bucknell 1888–89, Columbia Coll. 1895. *Elements of Logic*, 1893; *Ethics of Hume*, 1893; *Elements of Ethics*, 1894.

**Hyssop.** *Hyssopus officinalis.* Blue-flowered herb of the Mint family, native of Europe, introduced into N. America.

**Hyssop,** GIANT. Species of *Vleckia;* coarse herbs of the Mint family, natives of N. America.

**Hystapes.** Name attached to a lost book of pseudo-messianic *Prophecies*, much valued by Christians of 2d and 3d centuries, and credited to an "ancient King of the Medes."

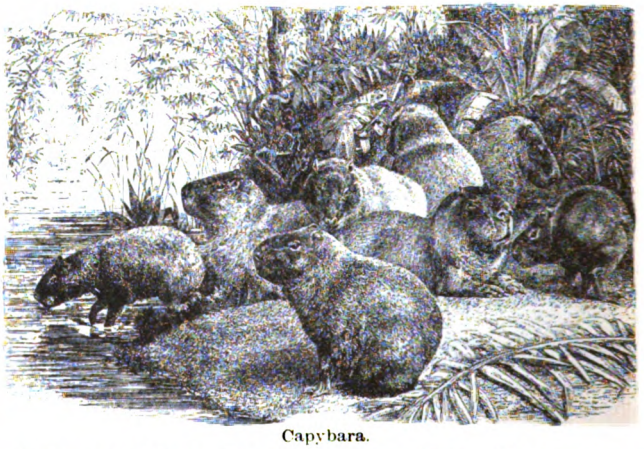
**Hysteranthous.** Plants whose flowers unfold subsequently to the leaves.

**Hysteria.** Diseased state, rarely observed save in women, in which there is a loss of control over the emotions, craving for sympathy, inclination to exaggerate and to imagine or simulate diseases. There is usually pain over the ovaries in the spine, top of the head, and other points, hyperæsthesia or anæsthesia, loss of sight or heaving, paralysis of any of the muscles, choking, attacks of laughing and crying, and symptoms, which may be assumed, of almost any disease. In no instances are there any changes in the organs, and the various manifestations are all assumed. It is usually dependent upon sexual disturbances, occurs most often in emotional weak-willed people, and is usually curable by change of scene, nourishing food, tonics, and measures calculated to strengthen the will-power.

**Hystero-Epilepsy.** Form of epilepsy in which there are various hysterical manifestations, usually incurable, and often terminating in insanity.

**Hysterogenic.** Intercellular spaces of plants which are developed in older tissues, generally by the breaking down of cell-walls.

**Hystricomorpha** (also in part termed SUB-UNGULATA). Division of *Rodentia*, including forms with usually 16 molars, upper lip not cleft, etc. The *Octodontidæ* are African and S. American forms, including Spiny Rats, the Beaver-like Coypu, etc. The *Hystricidæ* are the Porcupines. These have the body furnished with spines among the hair. The European form has a non-prehensile tail, and is terrestrial, burrowing and active at night. The American Porcupines are usually furnished with prehensile tails, and are arboreal. The Chinchillas are all S. American, small terrestrial and nocturnal animals,



Capybara.

with long hind legs. The molars are rootless. The fur is very soft. The *Dasyproctidæ* include the Agouti of S. America, with fore feet five-toed and hind feet three-toed. The *Caviidæ* have rudimentary tail, no clavicles, short incisors, three-toed feet, bearing hoof-like nails. All are S. American. The *Capybara*, the largest of living Rodents, may attain the length of four feet, and has webbed feet and leads a semi-aquatic life. The domesticated Guinea Pig is also a member of this family. The Calling Hare or Pika resembles the Guinea Pig externally, but belongs to the family *Lagomydæ* of the Duplicidentate section of Rodents.

# I

**I.** Used as a symbol for unity in the Roman notation. The small letter *i* represents in modern analysis the unit of imaginaries $\sqrt{-1}$.

**Iabadius.** Name ascribed by Ptolemy to an island in the East Indies, probably identical with Java.

**Iakhontov,** ALEXANDER, b. 1820. Russian poet and translator.

**Ialysus.** Ancient city of Rhodes; founded by Phenicians; held by Greeks from 1000 B.C. or earlier; predominant in the island till 408 B.C.

**Iambic Verse.** Most familiar form of modern meters, consisting of a short and a long syllable in succession. Blank verse usually has five of these feet. Its first use is credited to Archilochus of Lydia, d. 676 B.C.

**Iamblichus,** d. ab. 330. Syrian Neoplatonist. some of whose writings, chiefly on Pythagoras, are extant. The *Egyptian Mysteries*, tr. 1821, repub. 1895, is doubtfully ascribed to him.

**Iatro-Chemistry.** Rudimentary science, which flourished in the period following that of Alchemy. Its principal exponents were Paracelsus and Van Helmont, who taught that chemists were to discover and prepare all medicines, and that all chemicals were remedies for human ailments.

**Iazykov,** NIKOLAI, 1803–1846. Russian poet.

**Ibadan.** Town of the Yorubas, western Africa, about one hundred miles north of the Gulf of Guinea and four hundred west of the Niger. Pop. over 100,000.

**Ibea.** Name of British East Africa since 1890, derived from the initials of Imperial British East Africa, the British trade company there. Near the equator south of the eastern horn of Africa, east of Victoria, area 1,000,000 sq. miles. The territory was ceded to the company by the Sultan of Zanzibar in 1888 and 1891.

**I Beams.** Rolled wrought-iron or steel beams having two equal flanges and resembling the letter I in cross section. The heaviest sizes in the market are 20 in. in depth and weigh 250 lbs. per linear yard.

**Iberia.** Greek and Latin name for Georgia, as well as an old name for Spain.

**Iberians.** Inhabitants of Spain at the dawn of its history. But the aborigines had become amalgamated with invading Kelts; such remnants as the BASQUES (q.v.) alone remained unmixed. The original Iberians are supposed to have occupied northern Africa, southern and western Europe, and even Armenia. They presumably left the neolithic relics, and were preceded by a race which differed from them in not burying the dead.

**Iberville,** PIERRE LE MOYNE, SIEUR D', 1661–1706. French-Canadian naval officer, active against the English in Newfoundland and on Hudson's Bay; founder of Fort Biloxi, 1699, and of other posts on the Mississippi and at Mobile.

**Ibex.** Member of the OVIDÆ (q.v.) and genus *Capra* (goats). Different species inhabit the mountain heights of Europe and Asia. That in the Alps has been exterminated, except in limited regions under royal protection. It may attain a weight of 200 lbs. The horns of the male are nearly three feet long, remarkably heavy, and curve outward and back. The color is gray, with reddish tint in summer. The rutting season is January.

Ibex.

At other times the males live solitary on the peaks, where they are hunted with difficulty.

**Ibises** (IBIDOIDEÆ). Group of *Herodii*, including Herons and Spoonbills. These birds are schizorhinal; the bill is grooved through its whole length, and is arched in the genus *Ibis*, of which there are 30 species, mostly tropical. The Sacred Ibis (*I. æthiopica*), not now found on the Nile, has a black skin, with white feathers, the head and neck naked, and with long loose tertiaries, whose barbs are purple. The present Ibis of Egypt is the buff-backed Heron. It nests in trees in marshes.

**Iblis.** See EBLIS.

**Ibn Batuta** (ABU ABDULLAH MOHAMMED), 1304–1378. Arab traveler in Asia, Africa, and Spain 1325–54; author of an account of his journeys, tr. into French 1858–59.

**Ibn Jounis,** 979–1008. Arabian astronomer. A number of his observations have been preserved, the most interesting being those of eclipses in 829–1004, with an account of their employment in proving the acceleration of the moon's mean motion.

**Ibn Khallikan,** 1211–1282. Author of a great biographical dictionary in Arabic; resident of Damascus.

**Ibrahim Pashá,** 1789–1848. Son of Mehemet Ali, who became Viceroy of Egypt 1806. He had a brilliant military career in upper Egypt 1812, Arabia 1819, Peloponnesus 1824–28, and in Syria 1831, defeating the Turks at Tripoli and Homs and completely routing them at Konieh Dec. 20, 1832. At this point Russia interfered and peace was made, Syria being ceded to Mehemet Ali. He again routed the Turks at Nezib June 24, 1839, whereon the powers of Europe interposed to save Turkey. He was defeated by the British and driven out of Syria. From 1844 he held the government of Egypt, and was confirmed as Viceroy 1848.

**Ibsen,** HENRIK, b. 1828. Norwegian dramatist, long resident in Germany. His plays are extensively read in English versions, and the production of some of them in London and elsewhere has caused much controversy. *Brand*, 1866; *Peer Gynt*, 1867; *Pillars of Society*, 1875; *Doll's House*, 1878; *Ghosts*, 1881; *An Enemy of the People*, 1882; *Wild Duck*, 1884; *Rosmersholm*, 1886; *Hedda Gabler*, 1890; *Master Builder*, 1892.

**Ibycus,** 6th century B.C. Greek lyric poet, of whom fragments survive. In the legend, versified by Schiller, his murder was avenged by cranes.

**Ica,** or PUTUMAYO. River of Colombia, Ecuador, and Brazil, tributary to the Amazon; flowing through a wild region, and known only since 1874, but mainly navigable. Length ab. 1,000 m.

**Icarius.** Legendary founder in Greece of viniculture, which he learned from Dionysus.

**Icarus.** Son of Dædalus, attempting to fly with wings

Dædalus and Icarus.

fastened with wax, he fell, off Asia Minor, into the sea named after him.

**Ice.** Aggregation of snow crystals in such close contact as to render the substance mechanically and optically continuous. It may be formed under ordinary circumstances by reducing the temperature of water below 0° C. It has sp. gr. 0.917, crystallizes in hexagonal system, is slightly compressible, and does not conduct electricity. It is blue. The purest and strongest ice has an ultimate compressive strength of ab. 1,000 lbs. per sq. inch. See GROUND ICE.

**Ice,** LAW OF. On private waters, ice is real estate and belongs to the owner of the soil; on public waters it is common property and belongs to the first appropriator. An ice-covered, navigable stream or lake may become a public highway, in which case the traveler has a right of passage that is paramount to that of the ice-gatherer.

**Ice Age.** Period immediately preceding the human era, or perhaps contemporaneous with its early stages, when both in the n. and s. hemispheres evidences of the action of ice are more obvious than at any other time. See GLACIAL THEORY.

**Iceberg.** When a glacier descends to the level of the sea, large masses break off and are carried out into the ocean if they meet favorable currents. They rise into the air as high as 300 ft., ab. one-eighth of the entire bulk being above sea level. The Newfoundland banks are supposed to be formed by the detritus carried by icebergs and dropped there by the melting of the iceberg.

**Iceberg Theory.** Propounded to explain the presence of drift by the action of icebergs instead of glaciers. See GLACIAL THEORY.

**Ice-Blink.** Peculiar twinkling in the horizon, showing the presence of ice beyond.

**Ice-Boating.** Popular sport, which originated 1871 on the Shrewsbury River, N. J. It is now common wherever ice and wind offer favorable conditions, particularly across the Canadian border, on the Hudson, and on the Lake at Chicago. The Hudson offers ideal facilities, and racing with trains lends an especial excitement. The sails of an ice-boat are close-hauled, the sheets being always flattened after, whether by the wind or going free. The make-up of an ice-boat is peculiar.

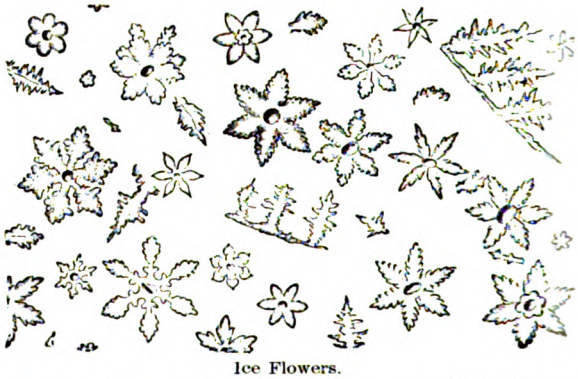
Ice-Boat.

The hull is a skeleton with two side timbers, a keelson and a triangular cross-piece whose base is much shorter than the sides. On each side of the base projects the runner plank, extending several feet. On these extensions are fastened the runners, and at the stern is the rudder runner. The cockpit is very shallow, often not over four inches deep. The runners are steel, shod with bar steel, and the two forward runners are considerably longer than the stern or rudder runner.

**Ice Breaker.** Angle or nose of the up-stream side of a pier, so shaped as to break up and ward off floating ice.

**Ice Columns.** Columnar crystals of ice seen on clear, cold mornings at the surface of damp gravel between the top layer and the ground below; evidently formed by the freezing of vapor rising through the interstices of the gravel.

**Ice Flowers.** If a strong beam of light be passed through a slab of clear ice perpendicular to the surfaces of freezing, the solid will begin to melt at points throughout its mass, and



Ice Flowers.

beautiful star-like cavities will appear, nearly filled with liquid. These are called Ice Flowers, and show the crystalline nature of ice. This experiment is due to Prof. Tyndall.

**Iceland.** Large island of volcanic origin, in the N. Atlantic. Its length is 300 and its breadth 200 m.; area ab. 40,000 sq. m. Its surface is mainly mountainous and barren. It contains the active volcano Hecla, and numerous hot springs and geysers. Reikjavik is the capital. It was settled from Norway 874. In 60 years all the habitable coast was occupied. Christianity was established by vote of the Althing 1000; schools and two bishoprics were founded. The government was at first hierarchic and aristocratic, afterward an aristocratic republic. It was brought under the sway of Norway by Hako V. 1262; in 1380 it became subject to Denmark, but has enjoyed home rule

since the celebration of its 1000th anniversary, when a new constitution was granted. Six members of the Althing are now appointed by the king, and thirty chosen by the people. The raising of sheep, cattle and horses, fishing and hunting, are the chief occupations of the people. Icelandic literature saw its most flourishing period ab. 1150-1230. The language is more closely allied to the old Norse than any other now spoken. The early inhabitants were daring sailors, who discovered Greenland 982, and a part of the American coast, which they named Vineland, ab. 990. Pop. ab. 69,000. See SCANDINAVIAN LANGUAGES AND LITERATURE.

**Icelandic Language.** Germanic language of the Scandinavian group. It begins with the colonization of Iceland from Norway in the 9th century, and down to 1200 closely resembles Old Norwegian. From 1200 to 1350, the so-called classical period, considerable changes are to be noted; and from 1850 it gradually takes the form of modern Icelandic. The literature, prose and poetry, is extraordinarily rich and varied.

**Iceland Moss.** *Cetraria islandica.* Lichen, native of the colder portions of the n. temperate zone, from which a nutritious jelly is obtained.

**Iceland Spar.** $CaCO_3$. Calcium carbonate, in colorless, transparent rhombohedrons, and exhibiting in a high degree the phenomena of double refraction. Fine specimens are found in Iceland, whence the name. Nicol prisms, used in polarizing light, are made from it. See CALCITE.

**Ice Machine.** Apparatus for the production of low temperatures by mechanical means. The principles of the mechanical theory of heat (see THERMODYNAMICS) have shown that the vaporization of a liquid and the increase in volume of a gas are phenomena during which heat is absorbed by the liquid or the gas. In the first case the heat is required to perform the interior work of vaporization, in the second to replace the work necessary to effect the dilatation. There are therefore two classes of ice machines; those which use a liquid volatile at relatively low pressures and temperatures, and those which expand a gas. Liquids of the first class are ether, ammonia, or gases liqueflable by pressure; air or any cheap gas may be used for the second plan. The gas or vapor is compressed and passed through a coil of pipe cooled by flowing water to lower its initial temperature as far as possible. It is then allowed to expand in a large closed chamber, and to pass from this into a second coil, which is in the medium to be cooled. For making ice, this medium is glycerine or one of the calcium salts of low freezing point; in this bath are put the vessels holding the water to be frozen. For refrigerating rooms, the coil of pipe simply surrounds the walls. The vapor or gas is drawn from this expanding coil to the compressing cylinder, thus making a closed circuit to avoid loss. In the air machine, the compressed air expands in a cylinder which helps drive the compressing cylinder, and so some of the work of compression is utilized and returned. Machines of these classes are much used in breweries, steamships, and large restaurants.

**Iceni.** Tribe of Britons in e. England, who revolted against the Romans 61 under the lead of their queen Boadicea.

**Ice Plant.** *Mesembryanthemum crystallinum.* Smooth herb of the natural family *Aizoiaceæ*, native of the Mediterranean region, bearing thick, fleshy, glistening leaves; often cultivated as a curiosity; also called Fig-Marigold.

**Ich Dien** (I SERVE). Motto of Edward the Black Prince, and still of the Prince of Wales.

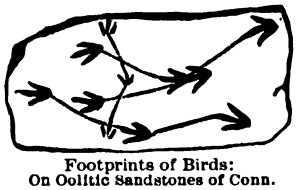
**Ichneumon.** Genus of cat-like Mammals, of several species, inhabiting n. Africa. See VIVERRIDÆ.

**Ichneumonidæ.** See ENTOMOPHAGA.

**Ichnolite.** Fossil track or footprint.

**Ichnology.** Science of footprints. The only information we have about some animals is found in their tracks made on mud or sand, now hardened into rock. The earliest evidence of birds consists in the footprints on the argillaceous sandstone of Connecticut. The tracks are generally made on some argillaceous material, but sometimes the impressions are transferred in relief to a superimposed sandstone layer. There are at least two ways in which the impressions are preserved. They may be formed along a shore uncovered long enough by the ebbing tide to allow the track to be hardened by the sun; another layer of sediment deposited by the flood tide covers and renders permanent the impression. They may also be preserved by the action of blown sand, which fills in the depressions and levels the surface to receive another layer of silt.

Footprints of a Tortoise: From Permian Sandstone of Annandale.



Footprints of Birds: On Oolitic Sandstones of Conn.

**Ichor.** In Greek and Latin Mythology, that which took the place of blood in the veins of the gods.

**Ichthyodorulite.** Fossil spine, forming part of the armor of a fish, usually in the front of a fin.

**Ichthyoidea.** Sub-order of *Urodela*, including two tribes: *Perennibranchiata* and *Derotrema*. The vertebræ are fish-like, biconcave, with persistent notochord.

**Ichthyol.** Sodium salt of ichthyolsulphuric acid. The acid is produced by the action of sulphuric acid upon a mineral oil containing ab. 10 per cent of naturally combined sulphur. It is used in pharmacy as a remedy in skin diseases.

**Ichthyolite.** In Paleontology, fossil fish, or any portion of a fish, as a scale, tooth, or spine.

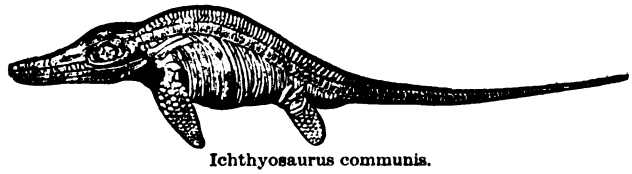
**Ichthyology.** Natural history of fishes. It began with *Historia piscium* of Ray and Willughby 1686, the works of Artedi 1734, and of Bloch 1784. This period was closed by Lacépède 1803. The second period, in which more attention was given to structure, was ushered in by Cuvier 1828, and continued by Valenciennes 1832–48, L. Agassiz 1833–43, J. Müller 1846, Günther 1880, and in the U. S. by Baird, Gill, Goode, Jordan, and Gilbert.

**Ichthyomorpha.** See URODELA.

**Ichthyophthira,** or FISH LICE. Copepods. See SIPHONOSTOMATA.

**Ichthyopsida.** See CRANIOTA.

**Ichthyopterygia.** Group of extinct Reptiles (Jurassic Period), of which *Ichthyosaurus* is typical. This was a huge seal-like animal, with a crocodile-like head, short neck, and flipper-like limbs. It had close-set teeth with folded surfaces. The tail was long and used for steering, perhaps propelling the animal through the sea. The orbit of the eye was 15 inches in diameter, encircled by bony plates. The length of body ranges from six to forty feet. These fossils are found in the Tertiary deposits of the Old World. See ENALIOSAURIA.



Ichthyosaurus communis.

**Ichthyopterygium.** Vertebrate limb as represented in the paired fins of fishes.

**Ichthyornis.** Type of toothed birds with powerful feathered wings and fish-like vertebræ; discovered by Marsh in the Cretaceous beds of the Western States. See ODONTORMÆ.

**Ichthyosaurus.** See ICHTHYOPTERYGIA.

Ichthyornis Victor (Cretaceous).

**Icon.** In Greek Ch., a flat image (painting or mosaic) of a holy personage, representations in relief being forbidden.

**Iconium.** Ancient town of Lycaonia or e. Phrygia, Asia Minor. See KONIEH.

**Iconoclasts.** Leo III., 726–741, and later Byzantine Emperors with their adherents, bitterly opposed to the cult of images; very violent, but finally unsuccessful. The Council of Constantinople, 754, condemned images and those who used them; that of Nicæa, 787, reversed its decisions. The controversy raged till 842, and involved the popes, who favored icons. —After the Reformation, Calvinists in France, the Low Countries, and Great Britain sometimes displayed similar iconoclas-

tic zeal. Modern opinion approves neither the worship nor the destruction of images.

Iconoclasts.

**Icosandria.** Class of plants in the artificial system, having more than ten stamens all inserted on the calyx, as in Cactus, Plum, Apple, and Rose.

**Icosandrous.** Flowers having numerous stamens inserted on the calyx.

**Icterus.** See JAUNDICE.

**Icthyosis.** Disease of the skin, in which it appears like that of a fish.

**Ictinus,** 5th century B.C. Greek architect, builder of the temple at Eleusis, of that of Apollo at Bassæ in Arcadia, and, with Callicrates, of the Parthenon at Athens.

**Ictus.** Stress on an accented syllable; important in the meters of Greek and Latin poetry.

**Ida.** 1. Mountain range in n.w. Asia Minor, celebrated in Greek legend: greatest height 5,749 ft. 2. Mountain in Crete, 7,675 ft. high. 3. Mountain in New Zealand, 70 m. n. of Dunedin.

**Idacius.** Bp. of Lemica, Spain, ab. 427; author of a Latin chronicle, 379–469, pub. 1619.

**Idaho.** One of the n.w. States, w. of the Rocky Mts. Its area is 84,800 sq. m. The n. part is made up of an alternation of mountains and narrow valleys, and is densely forested. These mountains extend along the e. border as far s. as the heads of Salmon River, where they attain to great height and are very rugged. The s. portion is in great part a basalt plain, through which the Snake River cuts a shallow cañon. Much of its surface consists of drifting sand, with sagebrush as its only vegetation. Along its s. border this plain is intersected by numerous ranges of mountains, which induce a partial supply of moisture, and the character of the country is somewhat improved. The industries are the mining of precious metals, agriculture, which is pursued in the s.e. part to a considerable extent, and cattle-raising. The capital is Boisé City. Idaho was organized as a Territory in 1863, and admitted in 1890. It is among the least developed of the States, but its resources are now receiving attention. Pop., 1890, 84,385.

**Iddesleigh.** See NORTHCOTE, SIR S.

**Idea.** Motion of the intellect; whatever is in consciousness as a mental picture or concept, as opposed to whatever is directly presented through the senses. This is a development away from the old Platonic use of the term, in which ideas were the pure immaterial patterns of any class of objects, and of which the individual objects were but imperfect representatives.

**Ideas,** ASSOCIATION OF. See ASSOCIATION.

**Ideal.** Pure product of the imagination, representing an unreal and unattained object of desire, or the perfect conception of some real order of things.

**Idealism.** Theory which either limits knowledge to the mere data of consciousness, supposing that the external world is not represented in its nature by those data, or maintains that the explanation of all things must ultimately proceed from the nature of the mind, not from the supposed influence of matter upon mind; opposed to Realism, and usually to Materialism.

**Ideler,** CHRISTIAN LUDWIG, 1766–1846. Prof. Berlin 1821; writer on astronomy, mathematics, and chronology.

**Idemfacient.** In the non-commutative multiplications of higher algebras, a factor which, operating as a multiplier, produces itself as the product.—Idemfaciend is a factor which as a multiplicand produces itself as the product.

**Idemfactor.** In Linear associative Algebra, one which by its operation produces itself as the product.

**Idempotent.** Expression which, when raised to the square or any higher power, produces itself as the result.

**Identity.** Sameness either of kind (relative) or of reality (absolute). See SELF.—In Mathematics, an equation true for all values of its quantitative symbols. Its sign is $=$. In any identity of one variable the coefficients of the like powers of the variable in the two members will be equal; if there be more than one variable, the same law holds for the coefficients of like powers or combinations.

**Ideoelectric.** Substances in which electrification can be developed by rubbing. See ELECTRIC.

**Ideo-motor Action.** Action of the voluntary muscles without the will being called into play; the movements of a hypnotized person afford an example.

**Ides of March.** In Roman calendar, 15th of the month; day chosen by the conspirators for the murder of Julius Cæsar.

**Idioblasts.** Single cells in an otherwise homogeneous tissue, which differ from the surrounding ones in some structural feature.

**Idiocy.** Weakness of intellect, usually accompanied by physical abnormalities, which exists from birth. Idiots are usually dirty, with well marked passions, but may be taught simple occupations and to care for themselves. The Salpetriere Hospital in Paris has a department for training idiot children.

**Idiom.** Form of speech peculiar to a language, and not literally translatable.

**Idioplasm.** That part of the protoplasm which carries the hereditary powers and governs development; now ascertained to be lodged in the chromatin of the cell nucleus or nucleolus. The original idioplasm of Nägeli was conceived as a structural system of micellæ in the protoplasmic threads of the cell reticulum. A cross-section of such a thread was supposed to give all the sorts of micellæ present in the cell, growth taking place longitudinally. Cell division alone affects the structure of the cross-section by a splitting of the fibril. Every species has presumably a different structure of the idioplasm, and development is explained as a successive activity of different rows of micellæ, much as the gemmules of the pangenesis theory become successively active.

**Idiosyncrasy.** Peculiarity which renders a person less liable to be affected by a drug, disease, or any condition influencing others.

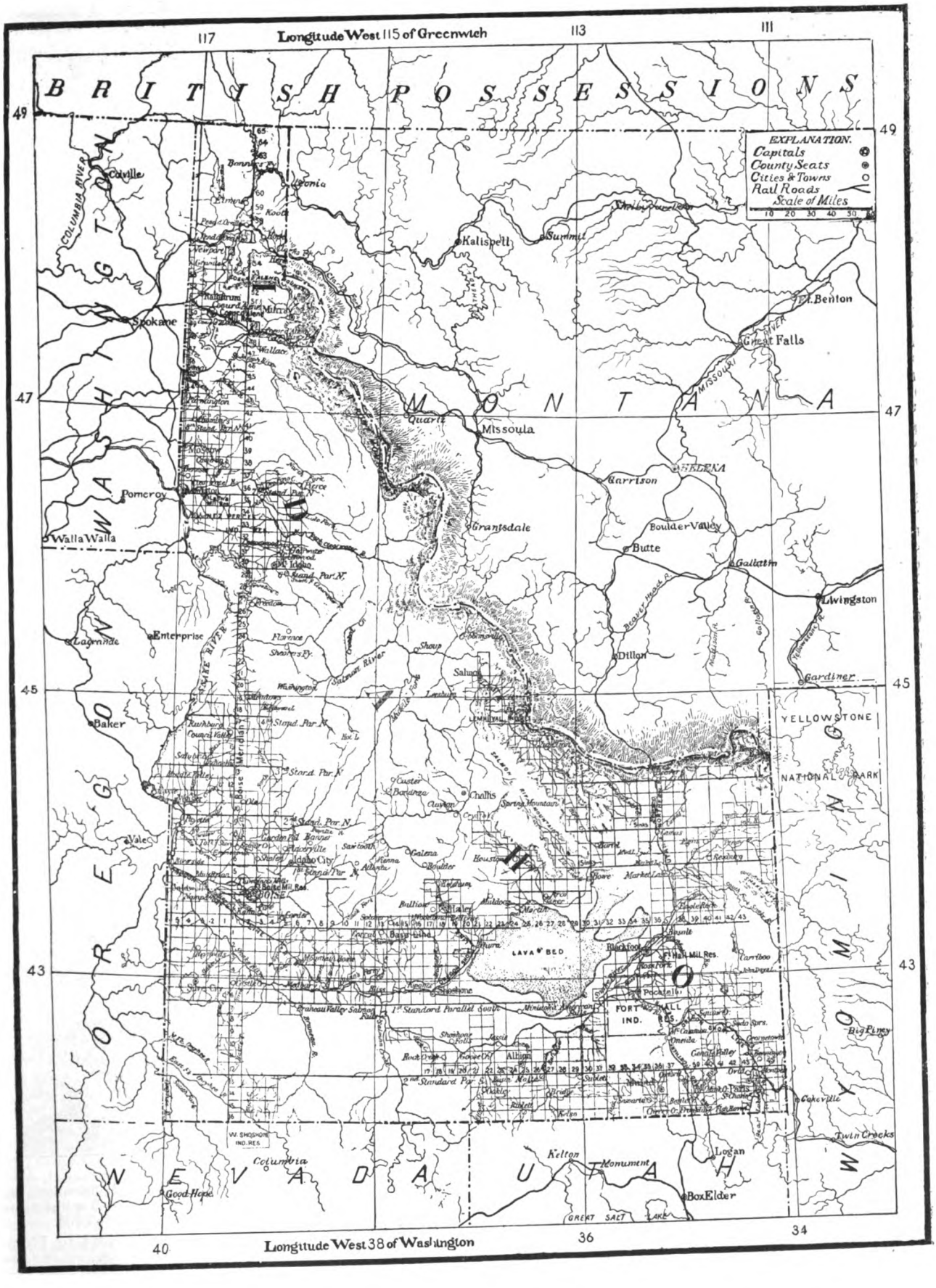
**Idocrase.** Vesuvianite; so named by Haüy.

**Idolatry.** Nearly universal among pagans of every age.

Nebo, Babylonian Idol.

Wooden Idols from Huaca, Peru.

With those who think, an image is intended to symbolize invisible Deity and stimulate devotion; with savages this idea is


Longitude West 115 of Greenwich
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BRITISH POSSESSIONS
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EXPLANATION.
Capitals
County Seats
Cities & Towns
Rail Roads
Scale of Miles
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WASHINGTON
MONTANA
OREGON
WYOMING
NEVADA
UTAH
COLUMBIA RIVER
Colville
Spokane
Pomeroy
Walla Walla
Lagrande
Enterprise
Baker
Vale
Boise City
Kalispell
Summit
Ft. Benton
Great Falls
Missoula
Quartz
HELENA
Garrison
Boulder Valley
Butte
Gallatin
Livingston
Grantsdale
Dillon
Gardiner
YELLOWSTONE
NATIONAL PARK
Salmon
Challis
Custer
Bonanza
Clayton
Spring Mountain
Houston
Galena
Bonanza
Bullion
Hailey
Muldoon
Market Lake
Rexburg
Blackfoot
Ft. Hall Mil. Res.
Pocatello
FORT HALL IND.
Big Piney
Cokeville
Twin Creeks
Logan
Box Elder
Kelton
Monument
Columbia
Good Hope
W. SHOSHONE IND. RES.
LAVA BED
GREAT SALT LAKE
Bonner's Ferry
Sandpoint
Wallace
Mullan
Pend Oreille
Kootenai
Boise Meridian
Salmon River
Snake River
Payette
Weiser
Mountain Home
Twin Falls
Malad
Oneida
Franklin
Bear Lake
Cassia
Minidoka
Lemhi
Clark
Fremont
Jefferson
Madison
Teton
Bingham
Bannock
Caribou
Oneida
Bear River
Cache
Ada
Canyon
Gem
Owyhee
Elmore
Camas
Blaine
Lincoln
Gooding
Jerome
Twin Falls
Cassia
Bear Lake
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Wasatch
Uinta
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Morgan
Weber
Summit
Wasatch
Uinta
Sweetwater
Lincoln
Uinta
Sublette
Fremont
Teton
Bingham
Bannock
Caribou
Bear River

obscured or lost, and a senseless thing becomes itself the object of worship. To the Greeks, art was probably inseparable from religion: ruder nations, having little or no sense of beauty, took the sign for the thing signified, and found in idol-worship a materializing and degrading influence. To the Hebrew lawgivers and prophets it stood for iniquity no less than for heresy: Christianity and Mohammedanism alike denounced it. In proportion as man is ignorant and unspiritual, image worship of any kind is apt to lose moral meaning and tend toward fetichism.

**Idorgan.** Individual of the rank of an organ of one of the *Metazoa*.

**Idrisi.** See EDRISI.

**Idstedt.** In Schleswig-Holstein; scene of a Danish victory, July 24-25, 1850.

**Idumæa.** Greek form of EDOM (q.v.). In Roman times it included the s. part of Judæa and the n. of Arabia Petræa.

**Idun.** Goddess of Norse Mythology, daughter of Svald and wife of Brage.

**Idyll.** Pastoral or semi-epic poem, of imperfectly defined character and scope. The most eminent examples are those of Theocritus and of Tennyson.

**Ierne.** Early name of Ireland.

**If.** Islet opposite Marseilles, off the s. coast of France, wholly occupied by a fortress. It has a lighthouse visible 9 m.

**Iffland,** AUGUST WILHELM, 1759–1814. German dramatist and actor, long popular in both capacities; director of the Berlin theater from 1796.

**Iglau.** Old town of w. Moravia, on the Iglawa; twice taken in the Thirty Years' War. Pop., 1890, 23,716.

**Iglesias,** JOSÉ MARIA, b. 1823. Acting Pres. of Mexico 1873–76; historical writer.

**Iglesias,** MIGUEL, b. 1822. Peruvian general; Pres. 1883; opposed by Caceres; in exile 1886.

**Ignacio,** JOAQUIM JOSÉ, 1808–1869. Brazilian admiral, distinguished in the war with Paraguay 1867–68.

**Ignatieff,** NICHOLAS PAULOVICH, b. 1832. Russian Envoy to China 1860, and to Turkey 1864; Minister of the Interior 1881 and 1889; active Panslavist.

**Ignatius,** ST. Bp. of Antioch, examined by Trajan, conveyed to Rome, and there martyred ab. 115. Of the 15 epistles ascribed to him, 7 are probably genuine. These, apart from their high claims for the episcopal office, show a guileless and apostolic spirit, attuned to the loftiest pitch of pure enthusiasm, expressed in passages of great poetic beauty. The legends of the saints present no figure of more lovable sanctity than this, which is at least semi-historic.

**Ignatius Loyola.** See LOYOLA.

**Ignatius Beans,** ST. Seeds of *Ignatia amara*, containing strychnine, and medicinally similar to nux vomica.

**Igneous Rocks.** Formed through fusion, and differing from sedimentary rocks by their vitreous, crystalline, or vescicular structure. They are divided according to their characterizing constituents into Orthoclase, Plagioclase, Nepheline and Leucite, and Olivine and Serpentine Rocks. They are also classified according to their history into Volcanic, which were cooled at the surface of the earth, and Plutonic, cooled beneath other rock masses.

**Ignis Fatuus.** Luminous appearance, seen in summer and autumn evenings, in churchyards and in marshy regions. Sometimes the light is stationary, sometimes rapidly moving. It has always been an object of superstitious dread. Its cause is not known; it has been claimed to be electrical and also an inflammable gas.

**Ignition.** A substance may be set on fire by the direct application of a heated body, by the heat due to sudden shock, friction, or the resisted electric current. Gunpowder under ordinary circumstances requires a temperature of ab. 300° C.; but increased density, moisture, sphericity of grain, and the smoothness arising from glazing, will give a higher temperature for ignition. The presence of gunpowder dust and angular projections will lower the temperature.

**Ignorance and Error,** IN ETHICS. Familiar form of excuse for the performance of actions otherwise wrong; limited by moralists generally to the cases where inquiry has been made and the ignorance or error is unavoidable.

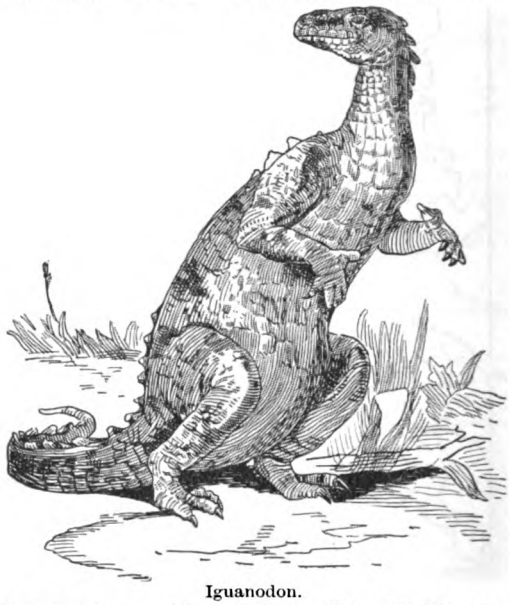
**Ignorantia Facti: Ignorantia Juris.** Words forming part of the maxim that "ignorance of fact excuses, but ignorance of law excuses not." The latter part applies peculiarly in criminal cases, for it would be against public policy to permit a law-breaker to plead as a defense his ignorance that his act was criminal. In civil cases, equity often relieves one who has been misled by ignorance of law, and courts of law do in a few instances. Ignorance of foreign law is treated as ignorance of a fact.

**Ignorantines,** or BROTHERS OF CHRISTIAN SCHOOLS. R. C. order, founded 1679 in France, and widely spread: occupied in teaching poor children.

**Igor,** SONG OF. Russian epic poem, probably of 15th century or later; pub. 1800. Its subject is a Mediæval battle.

**Iguana.** See CRASSILINGUIA.

**Iguanodon.** Extinct herbivorous Dinosaur of great



Iguanodon.

strength and stature, with peculiar scalloped teeth, resembling those found only in the modern Iguanodon of S. America.

**Ihlang-Ihlang.** Perfume of *Unona odoratissima*, a tree of the Malay islands. The oil of this tree, worth $250 a pound, is used in making the perfume of the same name.

**Ihre,** JOHAN, 1707–1780. Prof. Upsala 1748. *Svenskt Dialect-Lexicon*, 1766. His *Glossarium Suiozothicum*, 1769, was pub. by the state, and laid the foundation of Swedish philology.

**Ilarion.** Bp. of Kiev, Russia, 1050; theological writer.

**Ile-de-France.** Ancient French province, including Paris; embraced by the five rivers, Seine, Marne, Aisne, Oise, and Ourcy.

**Ileum.** See INTESTINES.

**Ilfracombe.** Watering-place in Devonshire, England, on a cove of the British Channel. Its situation is extremely pic-

Ilfracombe.

turesque, being overlooked by lofty hills and defended from the sea by a huge chain of rocks, on one of which a lighthouse is built, visible 10 miles at high tide. Pop., 1891, 7,700.

**Iliad.** Greek epic poem in 24 books, ascribed to Homer. Its subject is the wrath of Achilles and its consequences, with other episodes of the siege of Troy by the allied Greeks under Agamemnon and Menelaus. See HOMER.

**Ilia Muromets.** Mythical hero of old Russian songs and legends.

**Ilianthidæ.** See MALACODERMATA.

**Ilicineæ.** See AQUIFOLIACEÆ.

**Ilissus.** River e. of Athens; famous in classic times, now nearly dry.

**Ilium.** Broad, flat portion of the innominate bone.

**Ilium.** See TROAD.

**Illampu.** One of the highest peaks of the Andes; in Bolivia, near Lake Titicaca. Ht. 21,484 ft.

**Illecebraceæ.** Family of flowering plants of the class *Angiospermæ*, and sub-class *Dicotyledons*, comprising 20 genera and ab. 90 species, distributed throughout the temperate and tropical zones; called Knotworts.

**Illegitimacy.** Status of persons born out of lawful wedlock.

**Illimani.** Peak of the Andes, in Bolivia. Altitude 21,149 feet.

**Illinois.** One of the n. central States. Its area is 56,650 sq. m. The surface is in the main extremely level, being a typical prairie State. In the s. portion it becomes slightly broken by erosion, and a range of hills known as the Grand Chain crosses it from e. to w. The s. five-sixths of the State is covered by carboniferous formations, a small area in the n. only being floored with Silurian beds. Agriculture, and particularly the culture of the cereals, is the principal industry of the State; manufactures are coming in and yearly assuming greater relative importance. The value of farms, farming implements and machinery in 1890 was $1,297,327,525, and the value of the product was $184,759,013. In the same year there was invested in manufactures $140,652,000 and the product was $414,864,000. The principal mineral production of the State is coal. It had within its area, in 1893, 14,678 miles of road. The capital is Springfield, near the center of the State. The largest and most important city is Chicago, on the shore of Lake Michigan. The Territory was formed from the old Northwest Territory 1809, and admitted as a State 1818. The first settlements were made by Marquette and La Salle, the latter giving the name to the river from which the State is named. Pop., 1890, 3,826,351, one-sixth of foreign birth; density of pop. 67.5 per sq. mile. (See Map, page 364.)

**Illinois College.** At Jacksonville, Ill.; founded Dec. 1829–31; unsectarian. It has (1896) 10 professors, 89 students, and 125 in the preparatory department. It is the oldest college in the State.

**Illinois Indians.** Confederacy of five Algonquin tribes and one Dakota tribe (the Peorias), living in what is now Illinois. They sided with the French. Their lands were ceded to U. S. 1818. A small remnant is now in Indian Territory.

**Illinois River.** Branch of the Miss., heading in n.w. Ind. and flowing s.w.; connected by ship canal with Lake Michigan at Chicago. Length 397 m., drainage area 37,558 sq. m.; average flow 18,980 cub. ft. per second.

**Illinois,** UNIVERSITY OF. At Urbana; incorporated as the Ill. Industrial University 1867; opened 1868. Women were admitted in 1870, and authority to confer degrees gained in 1877. It received U. S. Land scrip to the amount of 480,000 acres, and conducts the agricultural experiment station for Ill. Up to 1895 the State had given it $879,900. It has (1895) 37 professors, 37 assistants, and 604 students, with 147 in preparatory department. Attention is given chiefly to the applied sciences. The library contains 27,750 volumes.

**Illiterates.** People who cannot read or write, or both. According to the census of 1890, 13.3 per cent of the population of the U. S. above 10 years of age were illiterates. In 1889 the ratio of adults unable to write to population was in England 9 per cent, Scotland 6, Ireland 23, France 15, Germany 4, Russia 85, Italy 53, Spain 72, Switzerland 5, Belgium 20, Netherlands 14, Scandinavia 3.

**Illuminated Manuscripts.** Known to the Egyptians and probably to all ancient peoples who used papyrus and parchment. The Byzantines and Italians only developed this art of illumination. In early times attention was given to coloring initial letters; gradually these letters increased in size until from the 8th century they were decorated in Greek and Latin manuscripts with pictures and miniatures. This practice gave rise to a special kind of Runic illumination in Ireland which spread through England and into the schools of Charlemagne in France.

**Illuminati.** Secret society founded at Ingolstodt, Bavaria, 1776; suppressed 1785. Its aim was a complete emancipation from superstition and tyranny. It spread rapidly for a time in Germany, Holland, and Italy, but a quarrel arose within the order and its secrets were divulged.

**Illuminating Gas.** Mixture of hydrocarbons, hydrogen, and carbonic oxide, produced by the destructive distillation of coal or by treating hot coke or coal with steam and heating the gas thus obtained with naphtha vapors. This is the so-called Water Gas. It gives light when burned, in distinction from fuel gas, which gives only heat. See COAL GAS and WATER GAS.

**Illusion.** In the broadest sense, mental deception of any kind; more specifically, wrong interpretation of an actual stimulus, in distinction from HALLUCINATION (q.v.), which has no underlying sense stimulus.

**Illustrations.** From earliest times efforts have been made to elucidate and adorn manuscripts and publications. This was necessarily done by hand until the 15th century, when woodcuts were introduced. Until very recently wood-engravings have been the principal source of illustration, chiefly because they may be treated like type and so printed with their reading matter. Copper and steel engravings give finer effects, and constant improvements are being made in lithography, in zincography, and in photogravure work.

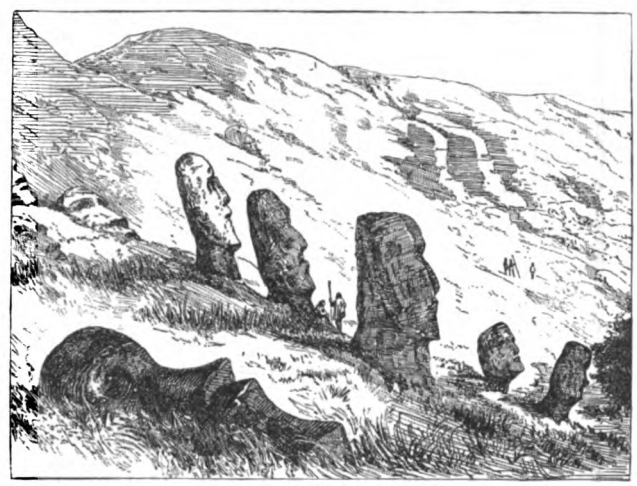
**Ill-Will.** Steady and settled feeling of anger, of milder degree than hatred, and not necessarily leading to any injurious action.

**Illyria,** or ILLYRICUM. Region e. of the Adriatic and n. of Epirus; subdued by Philip of Macedon; conquered by the Romans 219 B.C., again 168; organized as a province by Augustus 11 B.C.; w. limit of St. Paul's labors before his voyage to Rome.

**Ilmenite.** $(Ti,Fe)_2O_3$. Titaniferous iron ore, named from the Ilmen Mts., though not limited to that locality. The relative amounts of iron and titanium vary considerably in specimens from different deposits.

**Ilmenium.** Name given by Hermann to a doubtful metal found in æschynite and allied minerals. Considered to be impure Niobium.

**Image Worship.** Practically unknown till ab. 300; denounced by St. Augustine. The term is misleading, for images themselves are worshiped only through superstition, and not

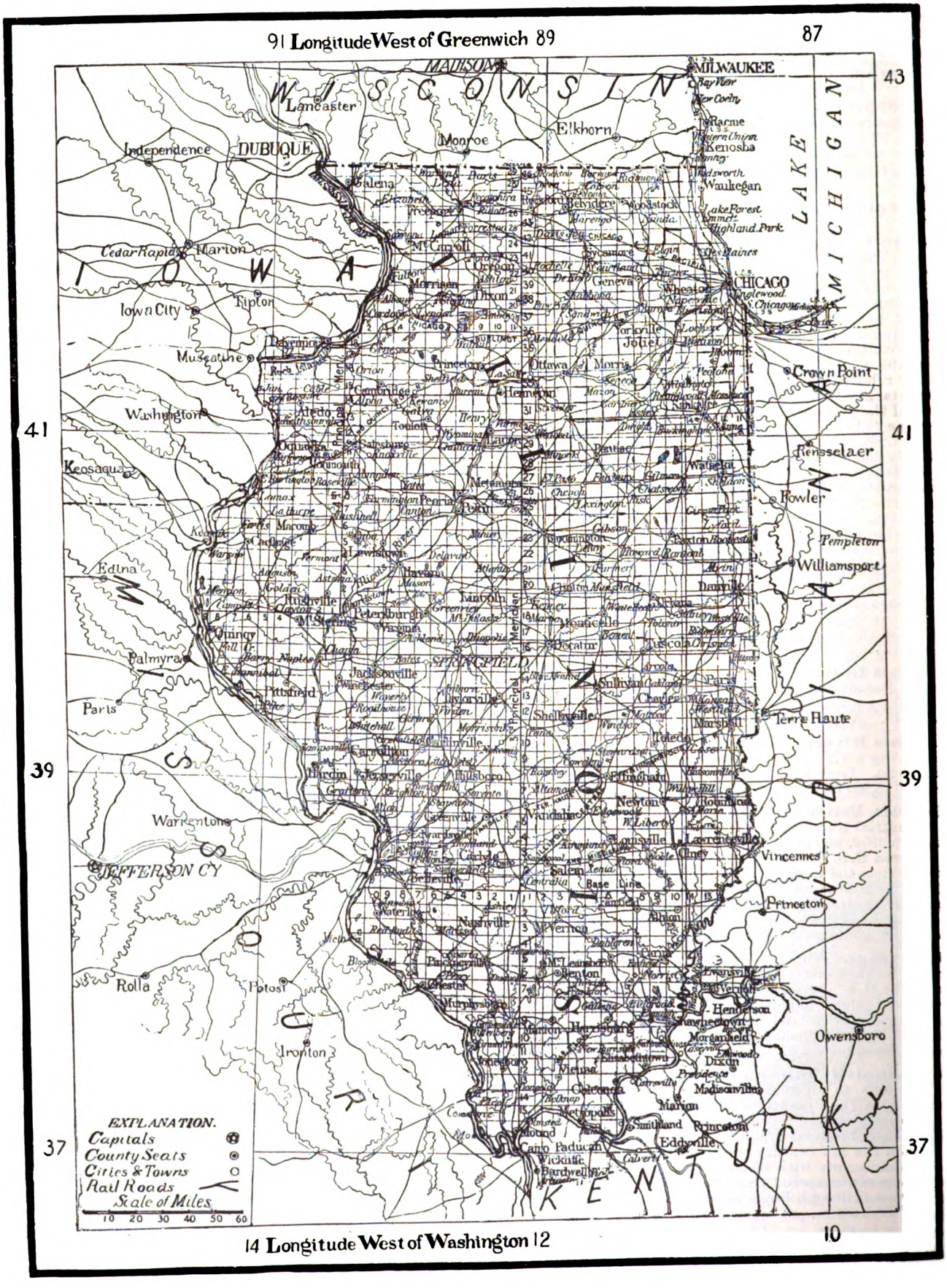


Images inside the Crater of Otuiti, Easter Island.

with Christian authority. The R. C. Ch. has for centuries allowed the use of pictures, statues, and crucifixes as symbols and aids to devotion. Lutherans may have paintings in churches; Anglicans may not. See ICON, ICONOCLASTS, and IDOLATRY.

**Imaginal Disks.** Structures derived from the hypodermis of the insect larva from which parts of the imago are formed during the pupa stage.

**Imaginaries.** Quantities containing an even root of a negative quantity. The imaginary unit is $\sqrt{-1}$, and is represented by i. The normal form of imaginaries is $a+b\sqrt{-1}$, in which a and b are real. This is a complex quantity. The pure imaginary is $b\sqrt{-1}$. Imaginaries are added and subtracted like real quantities. They may also be multiplied and divided, noting the effect of involution upon the imaginary unit. Even powers of i are real; odd powers remain imaginary. By introducing polar co-ordinates, the normal form, $a+b\sqrt{-1}$, becomes $M(\cos\phi + \sin\phi\sqrt{-1})$, where $M=\sqrt{a^2+b^2}$, the hypotenuse of a right triangle whose sides are the reals of the normal form and $\phi$. is the vectorial angle. M is called the Modulus or Absolute Value of the imaginary, and $\phi$ the Versor or Vector Angle. The Calculus of Imaginaries forms an important part in modern analysis.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WISCONSIN
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MADISON
MILWAUKEE
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Independence
DUBUQUE
Monroe
Elkhorn
Kenosha
Waukegan
Galena
Freeport
Belvidere
Woodstock
Cedar Rapids
Marion
McConell
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Morrison
Dixon
Geneva
CHICAGO
Wheaton
Iowa City
Tipton
Joliet
Davenport
Muscatine
Princeton
Ottawa
Morris
Crown Point
Cambridge
Hennepin
Washington
Aledo
Toulon
Streator
Pontiac
Rensselaer
Keosauqua
Ottumwa
Galesburg
Knoxville
Peoria
Metamora
Watseka
Fowler
Macomb
Bloomington
Pempleton
Edina
Lewistown
Havana
Williamsport
Rushville
Lincoln
Danville
Quincy
Petersburg
Decatur
Palmyra
Jacksonville
Winchester
Taylorville
Sullivan
Charleston
Paris
Pittsfield
Shelbyville
Terre Haute
Carrollton
Marshall
Hardin
Jerseyville
Hillsboro
Effingham
Newton
Warrenton
Vandalia
Louisville
Lawrenceville
JEFFERSON CY
Carlyle
Olney
Vincennes
Salem
Base Line
Belleville
Princeton
Nashville
Albion
Rolla
Potosi
Chester
Mt Vernon
Evansville
Henderson
Ironton
Murphysboro
Harrisburg
Owensboro
Morgantown
Dixon
Vienna
Providence
Madisonville
Marion
Metropolis
Smithland
Princeton
Cairo
Paducah
Eddyville
Wickliffe
Bardwell
EXPLANATION.
Capitals
County Seats
Cities & Towns
Rail Roads
Scale of Miles
10 20 30 40 50 60

**Imagination.** Representative function of mind; power of calling into play mental images, and of representation by their means. The raw materials of imagination are entirely the products of past experience; while they may be joined in new combinations, there is nothing new in the elements themselves. Imagination may be passive, as in the play of dream-images, or active or constructive, in which case the elements of experience are dissociated, recombined, and compared, as in the production of an imaginative work of art. The power and distinctness of imagination varies widely with times and persons.

**Imago.** Completed or adult insect, usually winged, resulting from the metamorphosis of the larva, grub, or caterpillar.

**Imbecility.** Mental weakness less pronounced than idiocy.

**Imbert de Saint-Amand,** ARTHUR-LÉON, BARON. French biographer, holding a high official post. His *Women of Versailles* and *Women of the Tuileries* extend to 26 vols.; a number have been tr. by T. S. Perry.

**Imbibition.** Process by which porous solids absorb fluids; due to a mutual molecular attraction, which Chevreul called Affinité Capillaire. While it will fill the pores with a fluid, it will by no means set up a permanent current unless the fluid be removed from one part while imbibition is going on at another.—In Plant Physiology, power of the cell-walls of growing vegetable organs of absorbing water, thus increasing their volume and size.

**Imbriani,** VITTORIO, 1840–1886. Italian poet, compiler, and critic.

**Imbricate.** Mode of æstivation in which the edges of sepals or petals overlap; also other overlapping organs.

**Imbros.** Island of the Ægean Sea, near the Dardanelles. Area 98 sq. m., pop. ab. 3,000.

**Imeritia.** Province of Asiatic Russia between Georgia and Mingrelia, s. of the Caucasus range of mountains; nearly identical with the old classical kingdom of Colchis. The

Imeritians of the Caucasus.

country is mountainous and wooded, and the climate damp and unhealthy. Those dwelling in the mountain districts retain their peculiar costume, as shown in the illustration.

**Imhof,** JACOB WILHELM, 1651–1728. German writer on genealogy.

**Imide.** Compound derived from ammonia by replacing two atoms of hydrogen in ammonia ($NH_3$) by a single organic radical or group, usually one containing carbon, hydrogen, and oxygen; as succinimide, $NH.C_4H_4O_2$.

**Imitatio Christi.** Properly, *De Imitatione Christi;* famous book of contemplative piety, ascribed to THOMAS À KEMPIS (q.v.). It has had editions and translations innumerable, is valued alike by Catholics and Protestants, and was the vade mecum of Comte the Positivist.

**Imitation.** In Music, a device of great utility especially in contrapuntal writing. It consists of a repetition by one voice, at any desired interval or distance, of a series of tones announced by another voice. When the original phrase is read backward, the imitation is by Reversion; when read in contrary motion, by Inversion; when the duration of the tones is extended, by Augmentation; when lessened, by Diminution.

**Imitation.** Bodily or mental repetition by an individual of any activity observed in another; particularly characteristic of the higher animals and of man. Conscious imitation first makes itself seen in the child between the fourth and seventh month, and from that time on becomes a most important factor in his development.

**Immaculate Conception.** R. C. doctrine, confirmed by Pius IX. 1854, that, by special grace, the mother of Jesus was, from the first moment of her existence, preserved not only from actual but also from original sin.

**Immanence.** Theory of Pantheism, that Deity pervades the universe.—Immanent is opposed to Transcendent, and means that the cause or subject of a phenomenon is in no way separated from it in time or space.

**Immanuel.** See EMMANUEL.

**Immaterialism.** Theory which denies that matter is the ultimate principle of the universe, but remains non-committal as to whether it shall be called personal spirit.

**Immaterial Products.** Utilities unconnected with any material body, and consequently consumed as soon as produced; *e.g.*, the services of magistrates, and the playing of actors. The earlier economists made a sharp distinction between such services and material products, but the tendencies of later economic thought have been to lay stress on their essential identity.

**Immer,** ALBERT HEINRICH, 1804–1884. Prof. Bonn 1850–81. *Hermeneutics of N. T.*, tr. 1877.

**Immermann,** KARL LEBERECHT, 1796–1840. German dramatist, novelist, and poet. *Alexis*, 1832; *Münchhausen*, 1839. His works were collected 1840–43 and 1883.

**Immigration** INTO THE U. S. Regulated by the Federal Government, not by the States. One of the latest statutes is the Act of May 5, 1892, "to prohibit the coming of Chinese persons into the U.S." The total number of immigrants, 1820–95, was 17,101,425, of whom 279,948 came in 1895. In 1892 the number was 623,084; in 1882, 788,992; in 1878, 138,469. In the years 1881–90 Gt. Britain and Germany sent each ab. 28 per cent of the whole number, Norway and Sweden 17, England 12½, Ireland 12½, Scotland 3, Italy 6, Russia and Poland 5, Austria 4½, France 1, all Asia 1.

**Immortality.** Doctrine held in ancient Egypt, but not by the Jews till 200 B.C. or later, when it was received by Alexandrian Platonists, probably from Socrates through the *Phædo*. It had a vague and doubtful existence among Romans and other races; thus Seneca professes it, but Marcus Aurelius does not. It was made clear and efficient only by Christianity.

**Immutability of Species.** Fixedness or unchangeableness of characters of animals as handed down through innumerable generations. A closer study of heredity, especially by Darwin, has shown that this fixity is not so rigid as was once believed.

**Imola.** Town of central Italy, on the Santerno, 22 m. e. of Bologna. It is surrounded by a wall and defended by a castle. It contains a cathedral, technical school, and has manufactures of wax, leather, silk, and majolica. Pop. ab. 12,000. The only specimen of Imola majolica is in the Sevres Museum; it bears a strong resemblance to the Italo-Moresco ware supposed to have been made by Moorish workmen in Italy.

Italo-Moresco Vase, 11 in. high (Sevres).

**Impact.** Effect or stress produced when one body suddenlly falls upon or strikes another. Structures subject to impact require to be heavier than those liable only to steady loads. For railroad bridges it is customary to add from 15 to 30 per cent to the static stresses, in order to allow for the impact stresses, a greater addition being made for short spans than for long ones. Impact tends to produce an alteration in the molecular constitution of metals, which renders them more brittle. The impact is direct if the bodies are moving in the same straight line and if the direction of the stress called forth by the impact is also in the same straight line. Impact not direct is oblique. The line of action of the stress developed by impact is called the line of impact.

**Impalement.** Vertical division of a shield into two or more equal parts and placing an equal number of distinct coats of arms severally in those parts, as the uniting the arms of a husband and wife.

Impalement.

**Impanation.** Presence of Christ's body in the eucharistic bread after consecration; term first used ab. 1125, and specially applied to Luther's doctrine, but not recognized by Lutherans.

**Imparidigitate.** Having the number of toes an odd number (perissodactyl).

**Imparipinnate.** Pinnate leaves having a terminal leaflet, as in the Locust, there being an odd number of leaflets.

**Impeachment.** Form of trial for certain public offenses, wherein one branch of the Legislature is the prosecutor and another is the court. It originated in England, where it has become practically obsolete; and has been incorporated into the National Constitution and most of the State Constitutions of the U. S. These define impeachable offenses, and regulate more or less minutely impeachment proceedings.

**Impedimenta.** Things necessary for the supply of an army, to be moved with it by means of wagons and draught animals: among these are equipments, provisions, munitions, baggage, forage, utensils, tents, camp and garrison equipage, and bridge trains.

**Impenetrability.** Property of matter in virtue of which no two portions of it can occupy at the same time the same portion of space. Evidently this applies strictly only to atoms; the fact that we often have an apparent contradiction to this principle in the case of mixtures or compounds is due to the porosity of the constituents.

**Impennes** (SPHENISCI). Family of natatorial birds, including the PENGUINS (q.v.).

**Imperator.** Under the Roman Republic, an officer possessing the Imperium, who had received the title from his soldiers after a victory, or from the Senate; under the Empire, official title of the Emperor.

**Imperforata.** Section of *Foraminifera*, including the orders GROMIIDEA, ASTRORHIZIDEA, MILIOLIDEA, LITUOLIDEA (q.v.).

**Imperforate Shell.** Gastropod shell with a solid columella.

**Imperial City.** Rome. See also FREE CITIES.

**Imperial Crown.** In English Heraldry, name given to the crown worn by the kings of England, but properly given to that worn by the German emperors. The state crown of Queen Victoria shown in the figure is highly enriched with precious stones.

State Crown of Queen Victoria.

**Imperial Guards.** Constituted in France by a decree of July 29, 1804, the old consular guard forming its nucleus. It consisted of one staff major-general, one regiment of foot and one of horse grenadiers, one of foot and one of horse chasseurs, one corps of artillery, one legion élite gendarmes, one battalion of sailors, one battalion of velites to each infantry regiment and one company of mamelukes to each regiment of horse chasseurs, with one company of veterans. Its strength was between 12,000 and 13,000 effectives, recruited from the finest soldiers who had served five years and taken part in two campaigns: it was commanded by four colonel-generals. Its special duty was to guard the Emperor, and till Waterloo it never quitted his presence. In 1807, by the addition of regiments of lancers, fusileers and dragoons, it was increased to a strength of 15,500 men.

**Imperial Institute** OF THE UNITED KINGDOM, THE COLONIES, AND INDIA. Established 1887 as a memorial of the Queen's Jubilee; intended to provide a museum of British products, to promote trade, and to further study in the school of modern Oriental languages founded in 1890.

**Impetigo Contagiosa.** Contagious affection of the skin, due to a micro-organism, most often observed upon the face and hands and in children, consisting of blebs, sometimes as large as a half dollar, which dry up, leaving flat, straw-colored crusts.

**Impey,** SIR ELIJAH, 1732–1809. Chief-justice of Bengal 1774–83; associated with Warren Hastings; impeached 1784 for the trial of Nand Kumar (1775), but acquitted.

**Implacentalia.** See APLACENTALIA.

**Implicit Function.** One in which the relation of the function to its variable is not directly expressed; opposed to explicit function.

**Impluvium.** See ATRIUM.

**Imponderables.** Heat, light, electricity, and magnetism; formerly so called on the supposition that they were a subtle form of matter which had no weight.

**Impost.** In Architecture, the point or line marking the junction of an arch with its supporting wall or pier. It is commonly emphasized by a projection called an impost molding. When the actual junction occurs at a point higher than the apparent impost, the arch is said to be stilted.

**Impost.** In general, any tax or duty; especially, duty on imports or exports.

**Impostors,** THREE. Term applied to Moses, Jesus, and Mohammed by Emperor Frederick II., according to encyclicals of Gregory IX., 1239. The original work bearing this title, if it ever existed, has not been found.

**Impost Stone.** Stone at the springing line of an arch upon which the arch ring rests.

**Impregnable.** Military position which cannot be carried by assault or by means of siege operations. Modern appliances of war have so greatly increased in destructive power that many positions heretofore deemed impregnable would now pass out of that category.

**Impregnation.** See FECUNDATION.

**Impregnation.** Form of ore deposit in which the ore particles are disseminated irregularly through a mass of rock. Impregnations, as a rule, have no sharply defined bounding walls, but change gradually into rock too poor to pay for working.

**Impressionists.** Painters working in open air and endeavoring to suggest the effects of hasty or wandering vision, things as they are really seen, rather than as we think we see them or appear to see them when attention is concentrated on some one object very near the eye. There are as many grades of talent and genius working in this direction as in others, and the best impressionist work is at least on a par with any of our time. Its inferior work is probably worse than any other, as being done under the influence of fashion and not from inner conviction.

**Impressment.** Forcing men into the army or navy by the exercise of the royal prerogative; now practically obsolete both on land and on the high seas. Britain's claim to exercise it over her subjects on neutral merchant vessels led to the war of 1812.

**Imprimatur.** Official permission to print a book, signed by the licenser in those countries where the press is under surveillance.

**Imprisonment.** Restraining the personal liberty of another, either by confinement, by the application of physical force, or by menaces. If illegal, the offender may be punished criminally, and also sued for damages by the injured party. Imprisonment for contract debts is generally abolished in Britain and in the U. S.

**Improper Fraction.** One in which the numerator is greater than the denominator. Its value is $> 1$.

**Improperia.** "Reproaches," sung in R. C. churches on Good Friday during the ceremony of the adoration of the Cross. The text consists of words supposed to be addressed by Christ to His people, with antiphonal responses, alternately Greek and Latin. Palestrina wrote some simple harmonies to the plain chant melodies used for these in 1560: the music has ever

since won admiration for its simplicity, pathos, impressiveness, the truthfulness with which it expresses the feeling of the solemn ceremonial, and the wonderful way in which it heightens the dramatic effect of the agonizing responses.

**Impropriation.** Grant of the revenues of a benefice to a layman or lay-corporation, thus differing from appropriation, in which the transfer was made to an ecclesiastic person or organization. Both practices were very common in England before and after the Reformation.

**Improvvisatori.** Poets or rhymers whose verses are composed and sung extemporaneously. The practice began with Petrarch, and was common in Italy from ab. 1475. In other countries it has flourished to a less extent. Theodore Hook was its chief exemplar in England. These productions, sometimes of great length, have been of slight literary merit.

**Impulse.** Stimulus to activity; usually confined to promptings to action of a more or less capricious and unreasoned character. See VOLITION.

**Impulse.** Force generated in impact; in Mechanics, uniform force required to bring a moving body to rest in one second. If W be the weight of a body in pounds, v its velocity, and g the acceleration of gravity, then the quantity $Wv \div g$ is the impulse in pounds. See FORCE.

**Impulse Wheel.** See HURDY-GURDY WHEEL.

**Imputation.** Theological tenet that men may be held responsible for Adam's sin, and delivered from that guilt by Christ's merits, the first being imputed to them by law, the second by grace.

**Ina.** King of Wessex 688–726; conqueror of Kent 694.

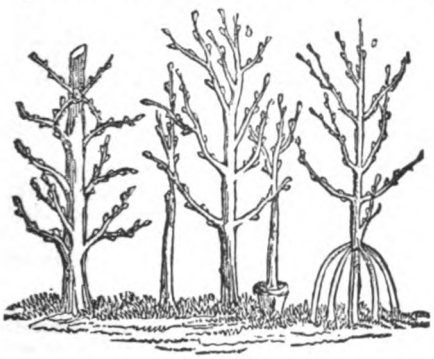
**Inæquitelæ.** See SPIDERS.

**Inagua,** GREAT AND LITTLE. Two of the Bahama Islands. The former is the most southerly of the group, 50x25 m., and the latter 8x6 m. The n.e. point of the former is in lat. 21° N. and long. 73° W.

**Inanition.** Starvation; condition resulting from deprivation of food or inability to assimilate it.

**Inantherate.** In Botany, filaments which bear no anthers; staminodia.

**Inarching.** Method of grafting in which the cion is not cut from the parent stock until after the graft has started to grow. The plants to be grafted upon are placed near the one



Inarching.

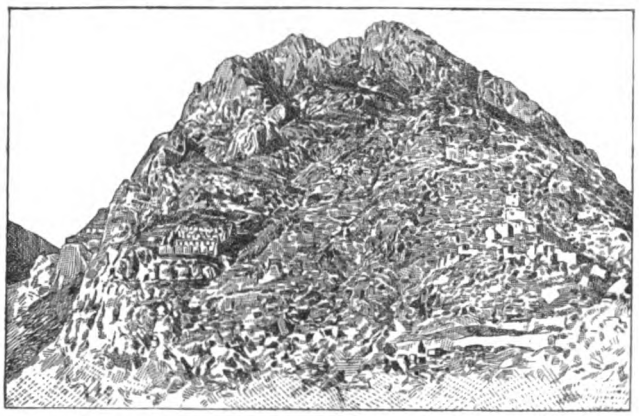
from which the graft is to be taken, joined together and allowed to remain for from 5 to 20 months. This occurs in nature when one branch crosses another.

**Inarticulata.** See CYCLOSTOMATA, BRYOZOA, and ECARDINES.

**In-Breeding.** Mating together of animals of the close relationship of parent and offspring or brother and sister. It has been practiced with good results in the formation of nearly all the improved breeds of livestock. If used with judgment, it tends to refine and intensify the characteristics of the parents, but has never yet been carried on indefinitely without deterioration of the stock.

**In Bye.** English mining term, meaning penetration further into the workings and away from the shaft; opposed to Out Bye.

**Incan Antiquities.** The architectural remains found in Peru are believed to be the work of the Incas. Although these relics are equal in size and importance to those of Yucatan and Mexico, they have features so distinct as to indicate an independent origin. Of the several people under Incan control, the Kechuans and Aymaras, although of the same stock and living in adjoining regions, differed in numerous ways. Among the Kechuans immense walls of huge stones, fitted together without mortar, were frequent, the principle of the arch was unknown to them, and their doorways narrowed in toward the top. Their walls rarely had any attempt at exterior or mural decoration. The Aymaras, on the contrary, built walls ornamented in low relief, and never made use of the narrowing door. The most celebrated region is the high, cold, and sterile plateau near Lake Titicaca, where the ruins cover more than a square mile. Here are three buildings called the Temple, the Fortress, and the Hall of Justice, because of surmises as to their original



Buildings of the Incas on the Cerro de las Carceles at Ollantai-Tambo.

use, immense in size, built of large stones so perfectly polished and fitted that no mortar is needed, although copper clamps and T-shaped mortises cut in the stone were in some cases used. Some of these sandstone and basalt stones were 25 ft. long, 14 ft. wide, and 6 ft. high. The builders and purposes of these structures were unknown to the natives at the time of the Spanish conquest. It was at Cuzco, the capital of the country, that the great Temple of the Sun, now a part of the church of San Domingo, then a building 300x50 ft., might have been seen. In Cuzco and throughout the country were many other skillfully constructed buildings, such as the Palace of the Virgins of the Sun and the Temple of Viracola, the hanging gardens of the Incas, aqueducts, roads, and many other evidences of the ability of these people.

**Incandescence.** The condition of being white-hot. A term used to describe the condition of the light-giving filament or carbon in an electric lamp.

**Incandescent Electric Light.** Pear-shaped glass bulb exhausted of air. Within this is a filament of carbonized bamboo or other fiber through which a current of electricity may pass. This filament by being heated to incandescence gives out light the intensity of which varies with the strength of the current. The commercial lamp in general use gives a light of ab. 16 candle-power on a circuit of 110 volts electromotive force.

**Incantation.** Form of magic in which some formula of words, generally without any attempt at sense but of great rhythmic power, is used, with effects good or ill within the discretion of the gifted chanter. It has been known among all nations and in all times, its remnants in the form of superstitions penetrating far into the bounds of civilization.

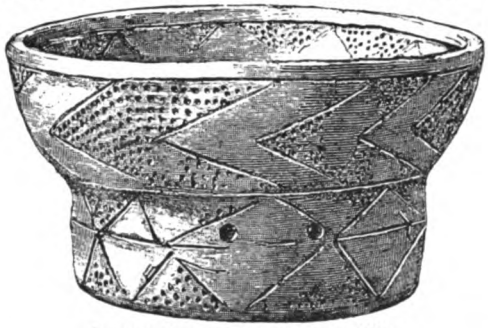
**Incarnation.** Appearance of Deity in human form; taking on of flesh, with other properties of man's nature, by the divine in Christ. Similar doctrines are found in the religions of India.

**Incas.** Rulers and people of Peru at the time of the conquest by Pizarro; now represented by the QUICHUA (q.v.). Their empire occupied the elevated plateaus of the Andes from the equator s. for 2,000 m., traversed by a wonderful system of roads. Bolivia was also subject to Inca rule. Irrigation was practiced, and a high state of civilization had been attained long before the conquest, as is evidenced by huge monolithic and other relics. The population was ab. 30,000,000. Artificial flattening of the skull was practiced. The complexion was rather light, the limbs weak, and chest large.

**In Cascade.** Term substituted for "in Series," especially when the devices joined together are Leyden jars. See BATTERY, ELECTRIC.

**Incendiary Composition.** Mixture of niter, sulphur, antimony, and resin, which, being placed in an iron shell called a carcass, was formerly used to set fire to buildings and shipping; now practically obsolete for military purposes.

**Incense.** Burned by Jews and Pagans in their religious



Incense Cup from Aldbourne, Wilts.

rites. It came into Christian use ab. 6th century, and is still employed in R. C. Ch., and by some others.

**Incense Distinguishing.** Japanese game, played by nobles at the court, with intricate apparatus and elaborate ceremonies. Incense of various kinds was successively burned in a censer, which was passed from hand to hand, a record being kept by means of counters of those who determined the order correctly.

**Incest.** Carnal knowledge of persons who are prohibited by law from intermarrying because of relationship; not indictable at common law, nor at present by statute in England, Ireland, or Wales, though a capital crime in Scotland. In the U. S. it is generally a statutory felony.

**Inch.** Unit of measure, used in determining the amount of water discharged from a flume in hydraulic mining. See MINER'S INCH.

**Inchbald,** MRS. ELIZABETH (SIMPSON), 1753–1821. English actress, dramatist, and novelist. She retired from the stage 1789, and pub. 3 collections of plays 1806–9, in all 42 volumes. Her novels, *A Simple Story*, 1791, and *Nature and Art*, 1796, were very popular.

**Inchcape.** See BELL-ROCK.

**Incidence of Taxes.** Ultimate payment of the amount assessed. When a tax is collected, he who pays it may add its amount to the price at which he sells the commodity taxed, or otherwise pass the payment of the amount on to some one else. The question of who really bears the burden of any given tax is the question of its incidence.

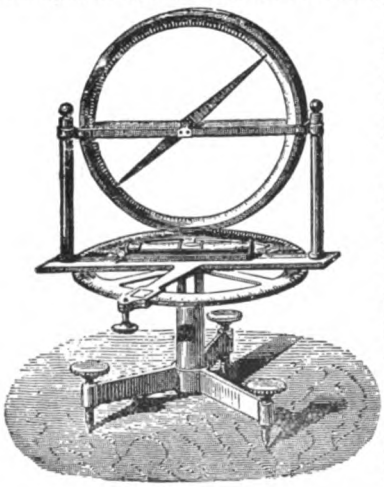
**Incidental Focus,** INCIDENTAL NODAL POINT, and INCIDENTAL PRINCIPAL POINT. See CARDINAL POINTS.

**Incised.** Leaves which are sharply cut by irregular incisions for a considerable distance into the blade, as in some of the Maples.

**Incised Wounds.** Wounds made by sharp cutting instruments. If it is possible to thoroughly cleanse them, after hemorrhage stops they may be sewed together, and should heal by first intention.

**Incledon,** CHARLES BENJAMIN, 1763–1826. English tenor, prominent as a ballad-singer from ab. 1790; in the U. S. 1817.

**Inclination** OF A LINE AT ANY POINT. Variance of its direction at that point from a fixed direction. In case of a straight line, expressed in Cartesian co-ordinates, the inclination is the angle made by the line with the axis of abscissas. In case of a curve, the inclination at any point is that of the rectilinear tangent to the curve at that point.



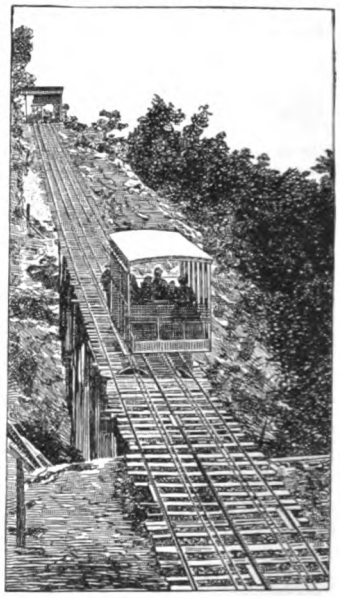
Inclination Compass.

**Inclination.** Dip of a magnetic needle; the angle it makes with a horizontal plane, when free to move in the magnetic meridian. It is subject to secular variations, the change being in the same direction for several centuries. At Paris 1671 it reached a maximum of ab. 75°; since that time it has been continually decreasing. The locus of all points on the earth at which there is no dip is the magnetic equator, and is called an Aclinic Line. The dip is 90 degrees at the magnetic poles. See DIPPING NEEDLE.

**Incline.** Sloping entrance to a mine; inposition, intermediate between ADIT (q.v.) and shaft; a slope.

**Inclined Plane.** One of the elementary machines by which a small power can be made to act through a large space, to lift or overcome a great resistance. The resistance is moved upon a plane so inclined to the horizontal line that the perpendicular distance from the latter to a point in the plane shall be the required height at that point to which the resistance was to be moved. When the power acts parallel to the plane, it need only be such a fraction of the resistance as is denoted by elevation ÷ length of plane. When the power acts parallel to the horizon, the fraction will be elevation ÷ base of the plane. When an inclined plane is wrapped around a cylinder, it becomes a screw.

**Inclined Plane.** When the grade of a railroad exceeds five per cent, or 250 ft. per mile, a locomotive can ascend it only slowly and with a very light load. Greater grades are often provided with stationary engines by which the cars are pulled up by a chain or cable. The inclined planes on the Portage road over the Allegheny Mts., built 1833, were the first in the U. S. In 1844 the planes of the Switchback road, near Mauch Chunk, Pa., were built for coal transportation; the length of the Mt. Pisgah plane is 2,320 ft., and its grade nearly 30 per cent. The plane on Lookout Mt., Tenn., has a length of 4,360 ft., with an average grade of 26 per cent. In Europe numerous mountain planes have been built for tourist travel; many of them are operated by locomotives with toothed wheels engaging in rack rails. The steeper grades, however, require the use of stationary engines. The maximum grade is about 60 per cent, or 60 ft. rise in 100 ft. of horizontal distance. See ELEVATING RAILWAY and CANAL LIFT.



Incline at Lookout Mountain, Tenn.

**In Cœna Domini.** (At the Lord's Supper.) Title (from the first words) of a papal bull against heretics, issued in various reccusions ab. 1300–1627, and repeated annually till 1770 on Thursday before Easter, though often objected to for its vehemence.

**Incombustible Fabrics.** See FIRE PROOFING and ASBESTOS.

**Income.** In the broadest sense, all articles of value which come to a person in a certain period. If some of these have to be expended again to obtain others, his real income is only what remains after these have been deducted. Especially, that which comes in the form of cash, or obviously prevents some pecuniary outlay.

**Income Tax.** One paid in proportion to a person's income; therefore a direct tax. It has many theoretical advantages, and has been frequently utilized. Yet it is necessarily somewhat inquisitorial; there is always difficulty in obtaining a truthful report of income, and it is distinctly unpopular in the U. S.

**Incommensurable Quantities.** Those which, being of the same kind, have no common measure.

**Incompatible Drugs.** Those which counteract the effects of each other, form chemical compounds which are inert, and have an effect different from that desired.

**Incomplete.** In Botany, flowers in which any one kind of organs is wanting.

**Incomplete Contraction.** Stream of water which is not contracted on all sides, as in the case of discharge from an orifice whose edge is rounded on one side. See CONTRACTED VEIN.

**Incomplete Equation.** One in which some power of the unknown in sequence is lacking. Such a term has zero as a coefficient, and must be supplied before applying the general principles of the theory of Equations.

**Inconvertible Paper Money.** Such as cannot be redeemed in coin on presentation, or to the redemption of which in coin at its full face value there is any obstacle whatever. It exists in a number of countries of Asia, Europe, and America.

**Increase Pound.** Variety of game of Marbles, resembling Ring-Taw.

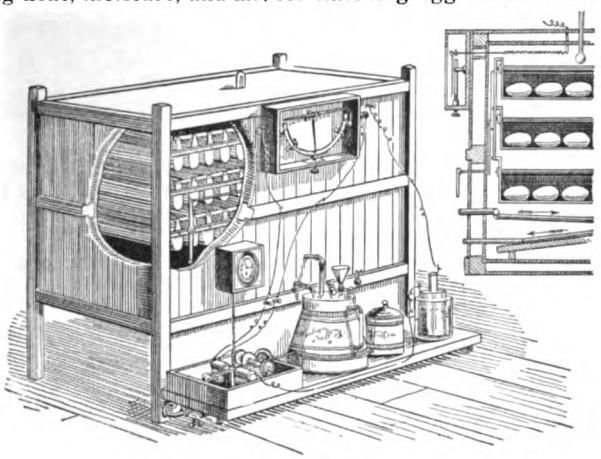
**Increasing Function.** One which increases or decreases with its variable. A given function may be increasing through certain values of its variable, and decreasing for other values.

**Increasing Return,** LAW OF. An increase of capital and labor applied to industries other than those engaged in producing raw materials generally gives a more than proportionate increase of return. Moreover, the improved organization resulting from an increase of capital and labor tends to diminish or even overcome any increased resistance which nature may offer to producing increased amounts of raw material.

**Increasing Twist.** Spiral grooves are cut on the interior of the bore of a rifled gun, and a rotating device is attached to the elongated projectile, that the latter may receive a sufficient angular velocity while traversing the bore to keep it true in its flight afterward. The pitch of these grooves is expressed in terms of the caliber of the gun, as one turn in 25 calibers. The rifled guns of the U. S. Service have usually an increasing twist, starting at the bottom of the bore with a twist of one turn in 50 calibers, and increasing to one in 25 calibers up to a point about 2 calibers from the muzzle: from this point on the twist is uniform.

**Incubation.** In Medicine, means the time between exposure to an infectious or contagious disease and its first manifestation; it varies for different diseases.

**Incubator.** Apparatus, provided with means of regulating heat, moisture, and air, for hatching eggs without the aid



Incubator.

of the parent bird. Artificial incubation has been known from the Egyptians down, and is now a matter of commercial importance.

**Incrustata.** See CYCLOSTOMATA and MOLLUSCOIDEA.

**Incubous.** In Bryology, leaves in which the tip of one overlaps the base of the next above.

**Incumbent.** Cotyledons of certain plants of the Mustard family, so folded in the seed that the back of one lies against the radicle.—Also anthers lying on the inner side of a filament.

**Incunabula.** Books printed before 1500. They are rare and critically valuable.

**Incurrent Canals.** Those leading from the inhalent pores of sponges to the ampullæ, either directly or by means of prosodal branches. They are formed in the simplest sponges by the budding of radial tubes from the paragaster of the original zoöid and the coalescence of such buds by means of trabeculæ, or in higher sponges by the general thickening and proliferation of the mesoderm, producin ; folds on the sponge surface. The incurrent canals are lined with ectoderm.

**Incurrent Openings,** or PORES. Besides those of the Sponges, the mouth of Tunicates and the ventral siphons of Clams, some of the zoöids of *Renilla*, etc., are thus designated. See INHALENT PORES.

**Incus.** 1. One of the bones in the mastax of a Rotifer's gizzard. 2. Second auditory ossicle of Mammals, represented by the quadrate bone in the lower classes of Vertebrates.

**Indamine.** See PHENYLENE BLUE.

**Indefinite.** Without limitation. The straight line, the plane, and space are indefinite unless restricted by points, lines, or surfaces arbitrary or fixed by conditions of the problem. These concepts may be limited at one or more boundaries, and indefinite in other directions.

**Indehiscent.** Fruits which do not split naturally to emit the seeds.

**Independence.** Capital of Jackson co., Mo.; founded 1827; taken by Confederates Aug. 11, 1862. Pop., 1890, 6,380.

**Independence Day.** July 4; anniversary of the Declaration of Independence, then reported to Congress, and signed from that day to Aug. 2.

**Independence Hall.** In Phila., on Chestnut St., above 5th; occupied as State House 1735. Here the Declaration was

Independence Hall.

adopted July 4, 1776, and the Convention of 1787 adopted the U. S. Constitution. It contains sundry historical relics.

**Independent Equations.** Those arising from conditions not dependent on each other.

**Independents.** See CONGREGATIONALISM.

**Independent Variable.** One which is or is considered as a primary element in the function. A function may arise from two or more variables independent of each other. Time may be considered the ultimate independent variable for all functions. In a function involving two or more variables, all but one may be treated as independent.

**Indeterminate Analysis.** Process of finding such solutions of indeterminate equations as meet known conditions; so that the results shall be positive integers.

**Indeterminate Coefficients.** The coefficients of powers or combinations of variables in identical equations; so called as attached to indeterminate quantities. The principles given under IDENTITY (q.v.) enable values to be found for assumed constants. Functions are thus developed, series reversed, rational fractions decomposed, and other results reached in higher analysis.

**Indeterminate Equations.** Those having two or more variables (or unknowns) and satisfied by an unlimited number of values assigned to the independent variable. — Group of n equations involving (n+1) or more variables.

**Indeterminate Forms.** So called since to them, considered independently, we may assign any value. They are: $\frac{0}{0}:\frac{\infty}{\infty}:0-\infty:\infty-\infty:0^0:\infty^0:1^{\pm\infty}$. If a function of two or more independent variables assumes one of these forms for two independent suppositions, the function is strictly indeterminate under these conditions. When a function of a single variable assumes one of these forms for a particular value of the variable, we may evaluate the function or determine the limit which the function approaches for the value of the variable.

**Index.** Exponent integral or fractional of a quantity taken, without sign, to indicate the power or root taken.

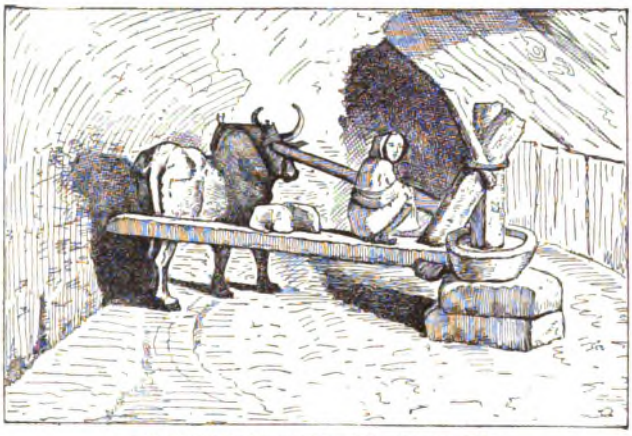
**Index.** See BALANCE.

**Indexing.** With increase of knowledge and books the need of good indexes becomes constantly greater. Their subjects are arranged in alphabetical or chronological order. The Index Society was formed in England in 1877 for the purpose of preparing indexes for old books and for special subjects in various books. Heinsius' and Kayser's are standard indexes of German books. Poole's index (1848) of current literature was the first of its kind in America; its third and most complete edition was issued in 1882. Since then additional volumes have kept the work up to date. The best index of scientific literature is the Index of Scientific Papers published by the Royal Society of England, although similar works devoted to special subjects are almost innumerable.

**Index Librorum Prohibitorum.** List of books forbidden to be read by the faithful; first pub. at Rome by Paul IV. 1559; committed by Pius V., 1566–72, to the Congregation of the Index, which has since issued ab. 40 editions.

**Index of Refraction.** Rates of the sine of the angle of incidence to the sine of the angle of refraction. See REFRACTION.

**India.** Country of s. Asia, a dependency of Great Britain. It consists mainly of a peninsula projecting s. into the Indian Ocean. The n. part is occupied by the s. slopes of the Himalayas. To this succeeds a low plain, drained and watered by the Ganges, the Brahmapootra, and the Indus, and then a plateau bordered on either side by the ranges of the Ghauts. The climate is hot, moist, and in the low lands unhealthy. Rice is the principal product, but much wheat, sugar, and cotton are raised. Much of the agriculture is carried on by the aid of irrigation, for which extensive works have been carried out. Calcutta is the capital. British India, or the Indian Empire, has an area of 964,992 sq. m.; pop., 1891, 221,172,952. The total area, including the native states, is 1,560,159 sq. m.; pop., 1891, 287,223,431. Ab. three-fourths of these are Hindus; ab. 50,000,000 are Mohammedans. Little was known in the W. about India before the expedition of Alexander the Great, 327–325 B.C.; he conquered the Punjab. Buddhism sprung up ab. 520 B.C.; Brahmanism came later. The first Mohammedan invasion (Mahmud of Ghazni) occurred 1001, and that of Timur 1398.



A Mill of the Upper Country—Native Life.

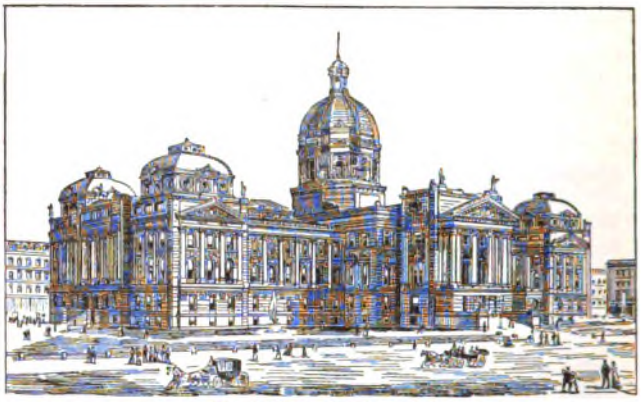
The Mogul Empire was founded by Baber 1525; Akbar reigned 1556–1605; Aurungzebe died 1707, and the Mahrattas extended their sway. The struggle between French and English, beginning 1746, led ultimately to the establishment of the British supremacy. Clive's victory over the Mogul at Plassey 1757 gained the provinces of Bengal and Behar, and introduced a century of conquest. Large additions were made under Warren Hastings 1772–85, Cornwallis 1786, Wellesley 1798, the Marquis of Hastings 1813, and others. The Mahrattas were subdued in 1818. Lower Burmah was annexed 1826 and 1852, Sind 1843, the Punjab 1849, Pegu 1853. In 1858 the Sepoy mutiny was put down, and the East India Company transferred the administration to the Crown. Queen Victoria was proclaimed Empress of India Jan. 1, 1877; Upper Burmah was annexed 1886. There have been two Afghan wars, 1838–42 and 1878–80, the first of which was disastrous to the British. India is governed by a viceroy appointed by the crown, and assisted by an executive and a legislative council. It is divided into provinces, which are under lieutenant-governors or native rulers.

**India Ink.** The use of this antedates that of our own writing ink. It is believed to have been invented in China ab. 260 or 220 B.C. Its English name indicates the way in which it first came to Europe. It is made of lamp black, obtained by preference from the oil of the *Elæococca cordata*, and animal glue, with musk or camphor in small proportions to hide the unpleasant odor of the glue. The ink of China is better and commands a higher price than that of Japan.

**Indiana.** One of the n. central States. Its area is 36,350 sq. m. Its surface is in the main level, comprising a large extent of prairie, especially in the n.w. part. In the s., near the Ohio, the erosion of streams has produced some relief. The principal rivers are the Ohio, which forms the s. boundary, and is navigable throughout, and the Wabash, which forms part of the w. boundary, and is also navigable. The geological formations are distributed quite simply. The s.w. part is underlaid by Carboniferous, succeeded by a narrow area of Devonian, which extends up and covers the n. e. part. In the s. e. and n. w. are found Silurian beds. The industries of the State are mainly agricultural, with growing manufactures. It has ab. 7,000 sq. m. of bituminous coal area, and in 1889 produced 2,845,057 short tons. The yield of petroleum in 1892 was 6,000,000 bbls., and the natural gas area was ab. 5,000 sq. m. The farm value in 1890 was $775,961,365, and of farm products in 1889 was $94,759,262. It has a very complete railroad system, having, in 1892, 6,030 miles of line in operation. The capital is Indianapolis, situated near the center of the State. This region was a part of the territory claimed by the French previous to the surrender of their American possessions 1763. When Ohio was organized as a separate territory, 1800, all the region w. and n. of Ohio was organized 1802 into the territory of I. Mich. and Ill. were afterward organized out of this territory. Since the admission of I. to the Union in 1816 its growth has been rapid. Pop., 1890, 2,192,404, or 60.3 per sq. m.

**Indianaite.** White porcelain clay, found in Lawrence co., Ind.; allied to kaolinite.

**Indianapolis.** Capital of Indiana and of Marion co., on e. bank of White R., near the center of the State. It is an important railroad center, having 12 railroads. Its streets



The Indiana State House.

measure 211 miles, about one-quarter of which are paved, mainly with cobblestones. It is supplied with water by the Holly system of pumping. Pop., 1890, 105.436.

**Indian Army.** See EAST INDIAN ARMY.

**Indiana University.** At Bloomington, Ind.; founded 1820. It had (1895) 52 instructors, with 667 students, a law school, and a library of 20,000 vols. It receives both sexes, and confers no honorary degrees.

**Indian Corn.** See MAIZE.

**Indian Dye.** See PUCCOON.

**Indian Mutiny.** See MUTINY, INDIAN.

**Indian Ocean.** Body of water e. of Africa, s. of Asia, and separated from the Pacific Ocean by the East India islands. Area 28,700,000 sq. m., mean depth 2,286 fathoms, greatest depth yet measured 3,097 fathoms.

**Indian Orders.** 1. The Imperial Order of the Crown of India, instituted 1878. 2. The Most Exalted Order of the Star of India, instituted 1861. 3. The Most Eminent Order of the Indian Empire, instituted 1878.

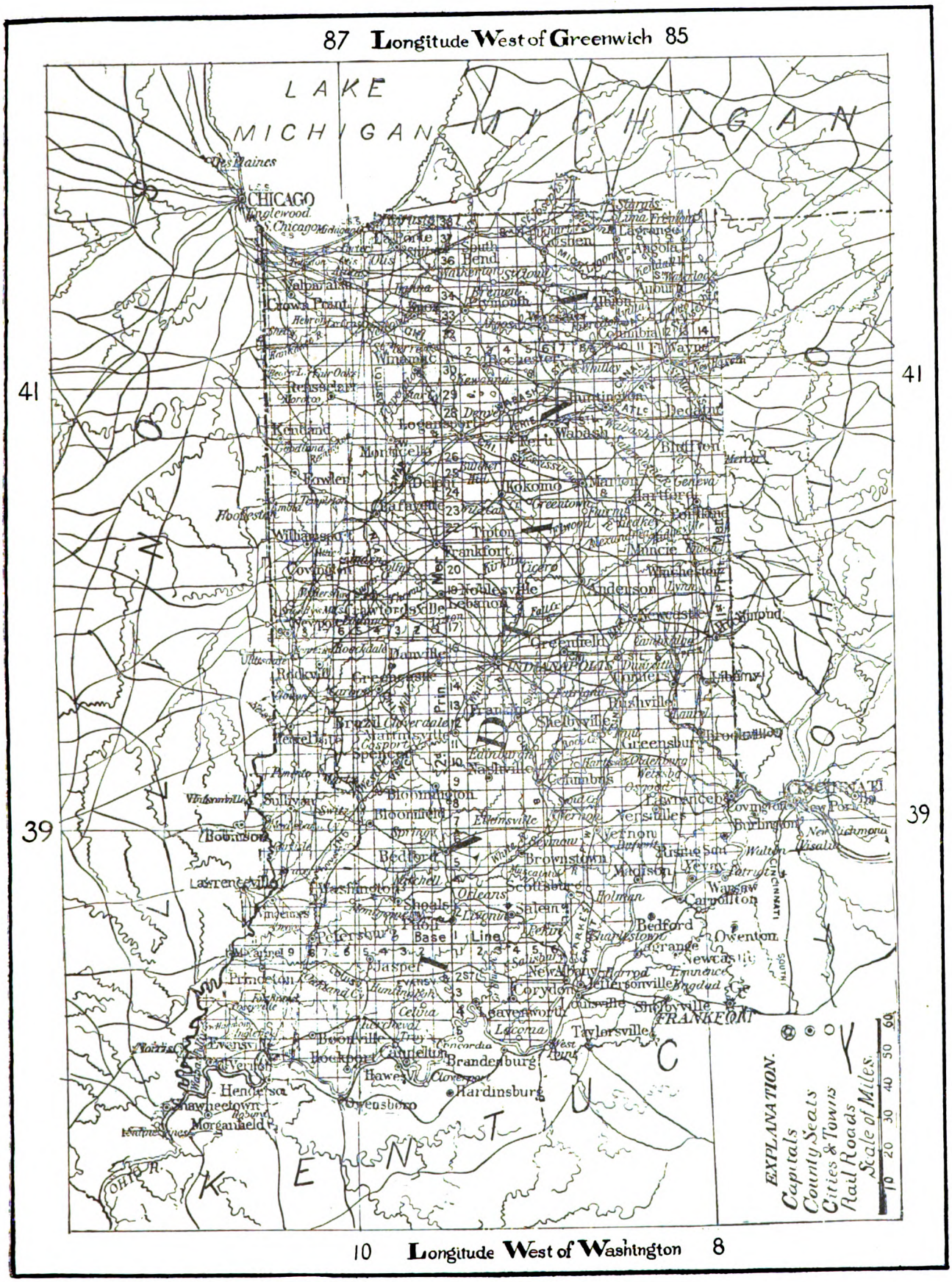
**Indian Pipe.** *Monotropa uniflora.* Plant resembling a white clay pipe when in flower. Also called Corpse Plant.

**Indian Poke.** See HELLEBORE, FALSE.

**Indian Province.** See ORIENTAL PROVINCE.

**Indians.** Originally designated the inhabitants of India and adjacent islands, now, primarily refers to the aborigines of America. Due to the mistaken idea of Columbus that he reached e. Asia on his w. voyage. Since that date the number of Indians in N. America have been reduced to one-fourth. By the U. S. census of 1890 there are 249,273 in the U. S., ab. half as many in Canada: 32.567 are taxed Indians and citizens. Alaska is supposed to contain 15,000 Indians. Probably all the Indians of the w. hemisphere do not exceed 12,000,000. In U. S. nearly all are now placed on special reservations. Some are well advanced in civilization; others still support themselves in part by hunting. Schools are maintained in most of the tribes by the U. S. Government and various religious bodies. As a race the Indians stand by themselves and are not derivable from any known race of the Eastern world. Their hair is straight, because circular in section, the head dolichocephalic, eyes horizontal, nose aquiline, cheekbones prominent. The color of the skin varies from black and brown through coppery tints to yellow and fair. There is a great variety of grades of civilization, from that of the Patagonians and Digger Indians, through the agricultural stage exhibited by the Iroquois up to the temple-building and literary stages of the Mexicans and Peruvians. The mound builders were true Indians. The language is polysynthetic with no affinities to other languages. There are ab. 430 distinct languages in N. America, and 330 in S. America, with innumerable dialects. The principal groups of Indians are the following: ALGONQUINS, APPALACHIANS, ATHA-

REFERENCE TO THE DIVISIONS OF INDIA.
1. PRESIDENCY OF BENGAL
N. W. P. North West Provinces.
C. P. Central Provinces.
Oude
Punjab
B. B. British Burmah.
L. P. Lower Provinces.
2. PRESIDENCY OF MADRAS.
3. PRESIDENCY OF BOMBAY
4. CEYLON
NATIVE STATES UNDER BRITISH PROTECTION
INDEPENDENT STATES—Nepal and Bhotan
INDIA
British Statute Miles 69.16=1 Degree
100 50 0 100 200
Railways thus
Do. Projected
Telegraphs
Longitude East of Greenwich.
BENGAL
CEYLON
MADRAS
MYSORE
N.W.P.
PUNJAB
CASHMERE
Nine Degrees Chanl.
Eight Degrees Chanl.
LACCADIVE
MALDIVE IS.


87 Longitude West of Greenwich 85
LAKE MICHIGAN
CHICAGO
Des Plaines
Englewood
S. Chicago
Valparaiso
Crown Point
La Porte
South Bend
Goshen
Angola
Auburn
Albion
Plymouth
Columbia
Ft. Wayne
Rochester
Winamac
Rensselaer
Kentland
Logansport
Huntington
Wabash
Bedford
Bluffton
Monticello
Delphi
Kokomo
Marion
Hartford
Portland
Fowler
Lafayette
Tipton
Muncie
Winchester
Williamsport
Frankfort
Covington
Noblesville
Anderson
Crawfordsville
Lebanon
Newcastle
Greenfield
Danville
INDIANAPOLIS
Rockville
Greencastle
Brazil
Shelbyville
Greensburg
Spencer
Nashville
Columbus
Bloomington
Sullivan
Lawrenceburg
Versailles
Vernon
Bedford
Brownstown
Madison
Washington
Scottsburg
Salem
Carrollton
Bedford
Owenton
Newcastle
Jasper
Princeton
New Albany
Jeffersonville
Corydon
Shelbyville
FRANKFORT
Evansville
Boonville
Tell City
Brandenburg
Hardinsburg
Henderson
Owensboro
Shawneetown
Morganfield
Taylorsville
Hole in Base Line
Principal Meridian
EXPLANATION.
Capitals
County Seats
Cities & Towns
Rail Roads
Scale of Miles.
10 20 30 40 50 60
41
39
10 Longitude West of Washington 8

BASCANS, AURACANIANS, AZTECS, CARIBS, ESKIMOS, FUEGIANS, IROQUOIS, MAYA-QUICHE, PATAGONIANS, PAWNEES, PERUVIANS, PUEBLOS, SHOSHONES, SIOUX, THLINKEETS, and TUPI-GUARANI (q.v.).

**Indian Shot.** *Canna indica.* Large-leaved herb of the natural family *Scitamineæ*, native of India; widely cultivated for ornament. Its seeds are round, hard and black, resembling shot.

**Indian Summer.** Period of warm, dry, hazy weather, occurring in the U. S. in Oct. or Nov. The haze is supposed to be smoke from distant prairie or forest fires, started by the Indians, and is similar to the High Haze of Germany.

**Indian Territory.** Tract of land between Kansas and Texas, set aside 1832–34 for the use of certain Indian tribes. Its area is 31,400 sq. m. The surface is mainly undulating prairie, being but partially wooded with broad-leafed trees. In the s. portion, a range of low mountains or hills runs into the territory from Ark., probably a continuation of the Ozark Hills. In addition to the tribes originally occupying the Territory, the U. S. Government has at different times introduced other tribes from various parts of the country, assigning to each a separate reservation. There are now representatives of ab. thirty tribes, ranging in population from 25,000 down to 40, with a total of 52,070. Five of the tribes, viz., the Cherokees, Creeks, Choctaws, Chichasaws, and Seminoles, have made considerable advance in civilization, and have governments and courts of their own corresponding in some degree to the local State governments. The w. portion was organized May 2, 1890, into the TERRITORY OF OKLAHOMA (q.v.). Total pop., 1890, 177,782, including ab. 108,000 whites and 17,712 colored.

**Indian University.** Opened 1880 at Tahlequah, I. T.; removed 1885 to Bacone; mainly for religious and normal training.

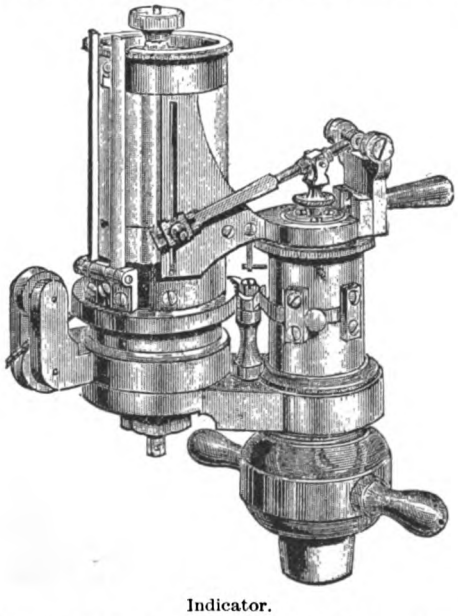
**Indian Wars.** See FRENCH AND INDIAN WARS.

**India Rubber.** See CAOUTCHOUC and GUTTAPERCHA.

**India,** STAR OF. See INDIAN ORDERS.

**Indications.** Term applied after 1877 by Gen. Myer to the official daily weather predictions of the Signal Office, as suggesting that they had attained a degree of reliability greater than suggested by the former term, Probabilities.

**Indicator.** Instrument first designed by James Watt for measuring and recording the pressure in a steam engine cylinder at each point of a stroke. The essential parts consist first of a cylinder, in which fits a piston, usually of an area equal to ½ sq. in. This cylinder is secured by suitable nipples, couplings, and cock to one end of the engine cylinder, so that the working steam acts on its lower side, to push it out. This pressure



Indicator.

is resisted by a spring of known and tested compressibility, secured to the top of the indicator cylinder. The position of the piston at any part of the engine stroke is therefore an indication of the cylinder pressure in the engine at that point. The rise and fall of the piston is multiplied three or four times by a system of leverage, combined with parallel motion, by which means stiffer springs can be used and less inertia has to be overcome in the moving parts. The end of the lever carries a pencil or tracing point to record the positions of the piston as the spring is more or less compressed. This record is taken upon a card wrapped around a drum, the latter being rotated nearly through a revolution by a cord whose free end is connected by a reducing device to the cross-head of the engine. A curve upon this card is traced for each revolution of the engine, and shows the succession of pressures at that end of the cylinder. From this diagram, knowing the scale of the spring, the mean steam pressure can be ascertained, and the horse-power computed. The diagram also shows defective valve-working, theoretical steam consumption, amount of back-pressure in exhausting the steam, losses by inadequate steam passages, etc. In condensing engines the line of back-pressure falls below the line of no pressure on the spring (atmospheric line) so that the spring is extended to an amount which measures the amount of vacuum in the condenser.

**Indicator Diagram.** Instrument for studying the action of a fluid of varying pressure and volume; devised by James Watt, and used practically for determining the work done by a steam engine. It has since been perfected so as to be applicable to many other cases in which a result is desired which is in any way dependent upon a product of two variables. It consists essentially of a sheet of paper and a pencil, which are made to have two relative motions at right angles to each other; the line traced upon the paper by the pencil and the area inclosed by it when referred to two rectangular datum lines, furnish means of calculating, in the case of a steam engine, *e.g.*, the total work done during a stroke, and the pressure or volume of the steam in the cylinder at any point of the stroke.

**Indiction.** Period of 15 years; so called from the indiction or proclamation of the tax-rate made by Charlemagne once in 15 years. When adopted by the Popes they ordered that it be reckoned from January 313. To find the year of the indiction add 3 to the common date and divide by 15; the remainder will be the number desired.

**Indictment.** Writing accusing one or more persons of a crime, presented by a grand jury upon oath. The most important part is the body, which must contain a clear, certain, and accurate statement as to the party indicted, the party against whom the offense was committed, and all essential facts relating to and constituting the offense.

**Indies.** See EAST INDIES and WEST INDIES.

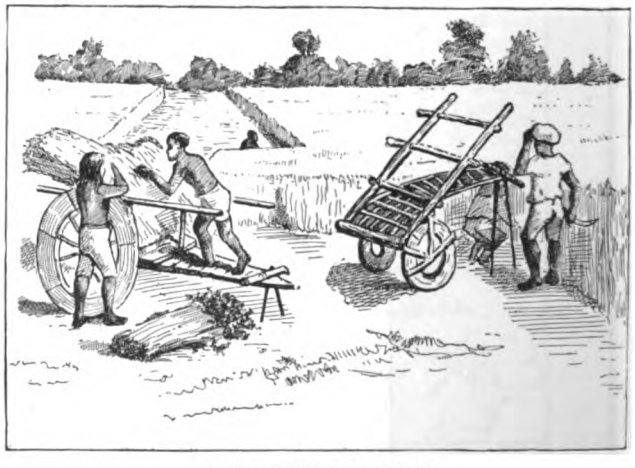
**Indifference.** That state of feeling in which there is no perceptible sensation of either pleasure or pain.

**Indifferent Actions,** IN ETHICS. Such as have not on either side any necessarily good or bad character, which could make it morally right or wrong to choose one rather than the other.

**Indifferentism.** Theory of volitions which maintains that in order to be free they must be indifferent to the various impulses and desires preceding them.

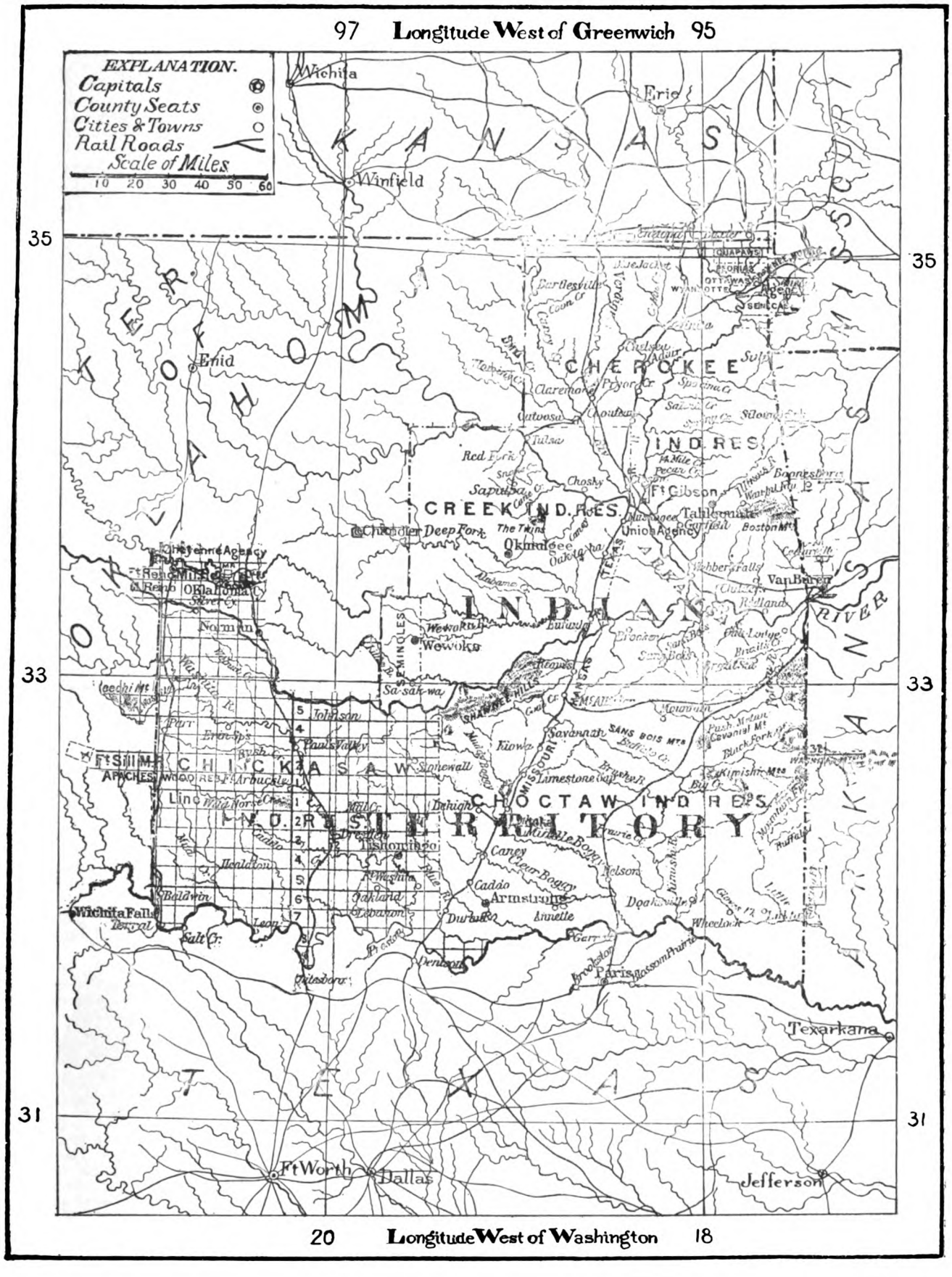
**Indignation.** Sentiment of anger, aroused by observing a wrong action, even when it does not affect ourselves.

**Indigo.** *Indigofera tinctoria*, a shrub of the natural family *Leguminosæ*, native of India, and *I. anil.* of tropical America, both widely cultivated in warm regions for the coloring



Indigo—Cutting the Plant.

matter they contain. Indigo is also produced from several other plants of the same family. The plants are steeped in water and the green solution oxidized by beating with sticks. The indigo is filtered out and pressed.


97 Longitude West of Greenwich 95
EXPLANATION.
Capitals
County Seats
Cities & Towns
Rail Roads
Scale of Miles
10 20 30 40 50 60
Wichita
Erie
Winfield
KANSAS
35
35
Enid
CHEROKEE
IND. RES.
Tulsa
Red Fork
Sapulpa
Chosky
Ft Gibson
CREEK IND. RES.
Chandler
Deep Fork
The Twins
Okmulgee
Union Agency
Tahlequah
Garfield
Boston Mts
Cheyenne Agency
Reno
Mill Creek
Oklahoma City
Norman
Van Buren
RIVER
INDIAN
Wewoka
SEMINOLES
Sa-sak-wa
33
33
Johnson
Paul's Valley
Ft Sill M.
APACHES
CHICKASAW
Stonewall
Arbuckle
Lino
Mill Creek
Tishomingo
Healdton
Baldwin
Wichita Falls
Salt Cr.
Leon
Oakland
Lebanon
Durant
Caddo
Armstrong
Annette
Caney
Clear Boggy
Savannah
SANS BOIS MTS
Kiowa
Limestone
Brazil
Kimishi Mts
CHOCTAW IND. RES.
INDIAN TERRITORY
Nelson
Doaksville
Wheelock
Paris
Texarkana
31
31
Ft Worth
Dallas
Jefferson
20 Longitude West of Washington 18

**Indigo,** False. *Amorpha fruticosa.* Shrub of the natural family *Leguminosæ*, native of U.S. Also species of *Baptisia*, American herbs of the same family.

**Indigo Blue.** See Indigotine.

**Indigo Carmine.** Solid indigo extract; also Indigo Extract (q.v.).

**Indigo Copper.** See Covellite.

**Indigo Extract.** Sodium or potassium salt of the sulphonic acids, prepared by treating commercial indigo with strong sulphuric acid; blue paste, soluble in water. It dyes wool a greenish blue.

**Indigo Sulphate.** See Indigo Extract.

**Indigo Sulphonic Acids.** Acids produced by the action of sulphuric acid upon indigo. See Indigo Extract.

**Indigotine.** $C_{16}H_{10}N_2O_2$. Indigo blue; dark blue crystalline substance with a coppery tinge, which constitutes the coloring matter of indigo; prepared by treating indigo with lime and zinc-dust, which dissolve it in the form of indigo white, and by oxidizing the solution of indigo white; exceedingly insoluble in all ordinary solvents, and therefore very fast when formed upon a fiber. See Artificial Indigo.

**Indigo White.** $C_8H_{12}N_2O_2$. White crystalline powder, soluble in alkalies; produced by the action of reducing agents, such as hydrogen, grape sugar, etc., upon indigotine. The oxygen of the air quickly turns it back into indigotine, removing hydrogen.

**Indigo,** Wild. *Baptisia tinctoria.* Native of e. N. America.

**Indirect Cell Division** (Karyokinesis). In this form the constriction of the cell plasm is preceded by the following changes in the nucleus. 1. The chromatic reticulum is transformed into a single filament (knäuel or mitom). 2. This shortens and thickens, presenting wreath or rosette forms, and breaks up into S or V-shaped loops. 3. The loops form a Helios (q.v.), and each loop splits into two. 4. The helios flattens into an aster, situated in the equator of a spindle, formed from the achromatic reticulum. These are the prophases (collectively, the anaphase): the process is termed anakinesis. 5. The aster becomes a dyaster by the attraction of the halves of the loops to opposite poles along the spindle meridional fibers. This is the metaphase (metakinesis). 6. Each daughter nucleus is formed by the passage of the daughter loops through the prophases in reverse order, which constitutes the kataphases (katakinesis). There is much variation in this process; the above is only a general scheme.

**Indirect Taxation.** Taxation, the burden of which does not fall on the person from whom it is collected by the government, but is shifted by him to some one else, and so continuously till it is really paid by the ultimate consumer of the goods, or other person who is not in a position to shift the payment to some one else.

**Indium.** In. At.wt. 113.7, sp.gr. 7.42, sp.ht. .056, valence III., mpt. 176° C. Discovered by Reich and Richter 1863. Rare, silvery white, soft, tenacious metal, not acted upon by the air at ordinary temperatures. It can be distilled at high temperature, is soluble in nitric acid, and with difficulty in hydrochloric and sulphuric acids. It occurs in very small quantities in certain zinc blendes from the Hartz and Freiberg.

**Indium Ammonium Sulphate.** $(NH_4)_2SO_4.In_2(SO_4)_3+24H_2O$. Indium ammonium alum; regular octahedra, made by bringing ammonium sulphate and indium sulphate together in molecular proportions and evaporating the solution.

**Indium Carbonate.** $In_2(CO_3)_3$? White crystalline powder, obtained on adding ammonium carbonate to a soluble indium salt.

**Indium Chlorides.** InCl. Monochloride: reddish substance, made from the dichloride by heating it with indium.—$InCl_2$. Dichloride: amber-yellow liquid, which solidifies to a white crystalline mass; made by heating indium in dry hydrochloric acid gas.—$In_2Cl_6$. Trichloride: white leaflets, made by heating indium oxide with carbon in the presence of chlorine.

**Indium Nitrate.** $In_2(NO_3)_6+9H_2O$. Lamellæ or long columns, made by dissolving the metal in nitric acid.

**Indium Sulphate.** $In_2(SO_4)_3$. Formed by dissolving the metal in sulphuric acid. It combines with ammonium sulphate to form an alum.

**Indium Trihydroxide.** $In_2(OH)_6$. White, gelatinous precipitate, obtained by treating indium salts with ammonia.

**Indium Trioxide.** $In_2O_3$. Honey-yellow powder, made by heating the metal in the air, or by heating the nitrate or carbonate.

**Individual.** Whole complete in itself, or single object constituting a whole in time or space, and either absolutely indivisible, or divisible only by destroying its integrity as a whole. Specifically, the term applies to a person, and often denotes the differential and subjective peculiarity of the person, or personal equation.

**Individual Capital.** That in possession of an individual, as distinguished from that of the whole community or nation. Many things would be counted as capital from a national point of view that would not from an individual, and vice versa.

**Individualism.** Social and ethical theory which estimates the worth of a system by reference to its outcome for the individual, and grants the largest amount of freedom to the individual, insisting that society is for the good of each man, and not each man for the good of society; tendency in political and social relations toward the most complete independence of judgment and action of the individual. The two interests of the individual and of the society or class of which he forms a part are necessarily in opposition, if not in conflict; individualism means the predominance of the former.

**Individuality.** The place of the individual in biology is a much mooted question. There are different ranks of individuality, and each individual, himself a complex of smaller units that work for mutual ends, is in turn a unit or part of a higher organism. Thus we have, in an ascending scale, gemmule, cell, gastrula, metamere, persona, cormus, colony, state (society). All these grades are not recognizable in even the most complex society. See Bion.

**Indo-China.** Name of the most easterly peninsula of s. Asia, between the Bay of Bengal and the China Sea. Area 815,000 sq. m., pop. 33,625,000. Great Britain holds there the countries of Burmah, Arrakan, Tenasserim, Manipur, and has a protectorate over the Shan states, while France owns Annam, Tonquin, Cochin-China, and Cambodia.

**Indo-European.** See Aryans.

**Indo-Iranian.** That branch of the Indo-European family which includes the Indians and the Iranians.

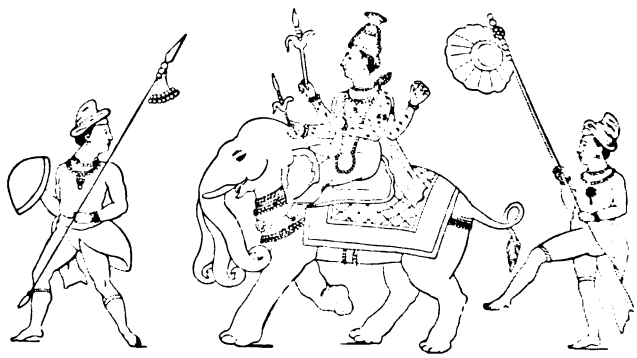
**Indoor Baseball.** Attempt to make the American national sport a winter pastime. It originated 1887 in Chicago at the Farragut Club, and became rather popular in the West for a time. It is played in a rink or hall. The ball is 17 in. in circumference, soft, and weighs 8¼ oz. The bats are 2 ft. 9 in. long and 1¼ in. in diameter. The bases are filled with sand but not attached to the floor; the distance between them is 27 ft. Straight-arm pitching only is allowed. The base-runner cannot leave base until the ball is struck, or, if not struck, reaches or passes catcher. The game is played by eight, or sometimes nine men on a side, and consists of nine innings as in outdoor sport.

**Indophenol.** $C_{16}H_{16}N_2O$. Product of the action of nitrosodimethylaniline on naphthol; dark powder, insoluble in water; changed into the more soluble indophenol white by the addition of hydrogen; blue dyestuff, used similarly to indigo. See Indigo White.

**Indore.** Native State in Central India, composing the territories of the Holkar dynasty. Area 8,402 sq. m., pop. 1,094,150.—Also capital of same name, founded 1770. Pop., 1891, 92,170.

**Indorsement.** Signature on the back of a bill, note, or check, making it payable to another person, the signer being responsible.

**Indra.** Second principal deity of the Vedic pantheon, regarded as god of heaven, king of the gods, and Jupiter of the



Indra.

Hindu Olympus. He greatly resembles Agin, and is without doubt a secondary form of that divinity.

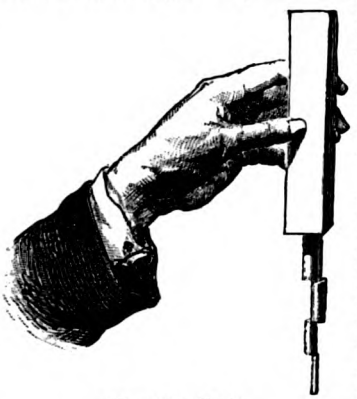
**Indris.** Genus of ape-like Lemurs, distinguished by having well-developed hind legs, sometimes used alone in progression, a rudimentary tail, short muzzle, naked face, large thumbs on

all four hands, and dentition like man's, but with one incisor less in the lower jaw. The color is variable.

Indris (*Lichanotus mitratus*).

**Inductance.** Coefficient of SELF-INDUCTION (q.v.).

**Induction.** Process of reasoning from particular facts to general principles, or from premises to conclusions representing more and wider truth than the premises. The conclusion has only probability of greater or less degrees, according to the nature of the data and the extent of the mind's conformity to the principles of induction, which are the canons of agreement and difference. The process is opposed to Deduction, and, because it goes beyond the premises, requires verification in order to become knowledge. It should be carefully distinguished from Scientific Method, which includes, besides Deduction, processes that are not reasoning at all, as steps in the advancement of knowledge.



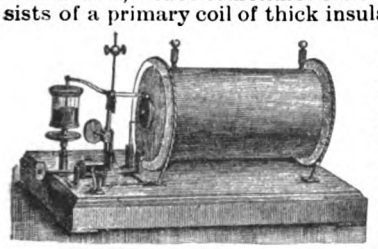
Magnetic Chain.

**Induction,** ELECTROSTATIC. Influence which an electrified body exerts upon a conductor which is not in direct contact with it, and by which this conductor may be electrified. — ELECTRODYNAMIC. Influence by which an electrical current causes by its own variations a secondary or induced current in all adjacent conductors.—MAGNETIC. Influence by which a magnet produces magnetism, temporary or permanent, in all magnetic bodies in its vicinity.

**Induction Balance.** See HUGHES' INDUCTION BALANCE.

**Induction Coil.** See INDUCTORIUM.

**Inductorium.** Electromagnetic induction machine, the object of which is to obtain high electromotive force by making use of a source of large quantity but of comparatively low electromotive force; invented by Dr. Page and improved by Ruhmkorff; hence sometimes called Ruhmkorff's coil. It consists of a primary coil of thick insulated wire and few windings, in the center of which is a core of soft iron wires. Outside of this is the secondary coil, of fine wire and very many turns. The primary coil is connected with the source of current, and in the circuit is an interrupter. Thus an intermittent current of high electromotive force is induced in the secondary coil.



Ruhmkorff's Coil.

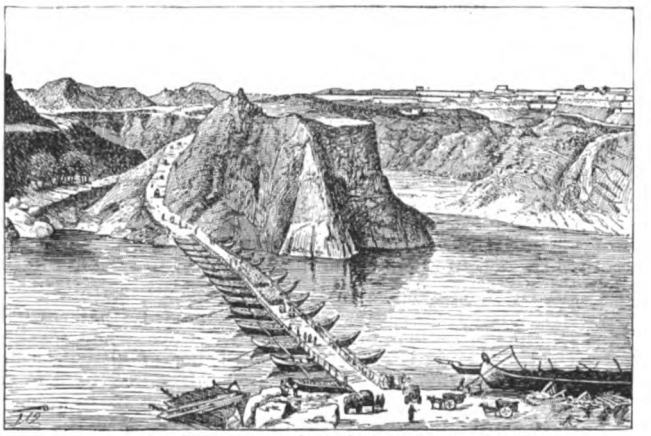
An important addition to the apparatus, made by Fizeau, is the condenser, which is connected on the two sides of the interrupter: its function is to prevent the spark of the extra current in the primary when the circuit is broken. Instruments have been constructed which will give a spark a meter or more in length.

**Indulgence,** DECLARATIONS OF. Issued in England by Charles II. 1662 and 1672, and by James II. 1687, to relieve Dissenters from penalties; really in the R. C. interest, and as such unpopular. The last, with the imprisonment of seven bishops for refusing to order it read in the churches, contributed powerfully to the fall of the Stuarts.

**Indulgences.** Remissions of ecclesiastical (and as some Catholic divines hold, of purgatorial) penalties of mortal sins whose eternal penalty has been already remitted in the Sacrament of Penance (see ABSOLUTION). Their sale contributed materially to the Protestant Reformation, and was condemned by the Council of Trent.

**Induline.** $C_{18}H_{16}N_3Cl$. The water-soluble induline, or nigrosine, is $C_{18}H_{13}N_3S_2O_6Na_2$. It is produced by numerous reactions, of which heating aniline salts with iron and nitrobenzene is the most important. Blue dye-stuffs, used for numerous purposes; black powder insoluble in water.

**Indus.** River of n.w. India. It rises in the w. Himalayas, flows at first n. w. with the course of the ranges, then turns



Bridge of Boats over the Indus at Khushal Garh.

s. w., cutting across them, and finally enters the Arabian Sea through a delta. Length 1,800 m., drainage area 372,700 sq. m.

**Indusium.** Membrane which covers the sorus in certain ferns.

**Industrial Efficiency.** Capacity of the laborer for efficient service in the production of wealth, arising from the degree of his physical strength, the relative supply of sustaining food, the sanitary conditions of his life, his intelligence, and other causes.

**Industrial History.** That aspect of history which considers the changes and development of means of production and exchange, and the systems of landholding and industrial organization in vogue at different periods. It is sometimes more narrowly used to include only the history of manufacturing methods, excluding landholding, trading, and population.

**Industrial Organization.** Relations of men to one another in the production, distribution, and exchange of economic goods; contrasted with political or religious, but often synonymous with social organization.

**Industrial Partnership.** System in which employés are admitted to some share in the profits of a business, though they have no share in the control of the concern and are not responsible pecuniarily for any of its losses.

**Industrial Revolution.** Series of economic changes which occurred in England ab. 1775–1800, and has followed at intervals in several other countries. It consisted in the introduction of improved machinery, the application to it of steam power, the development of means of communication, the abolition of legal impediments to industry, and similar changes.

**Industrial Schools.** Term of vague limits, including institutions, neither kindergartens nor technical colleges, where practical and mechanical, rather than theoretical and literary, training, is given, generally in connection with common school studies. The value of such training has become so apparent that the public schools of our cities are introducing industrial departments.

**Industrial State.** That aspect of the State, of society, or of national life, which contemplates it on the side of its material well being, rather than of its political existence; as composed of agricultural, commercial, and manufacturing producers, rather than of political units.

**Industrial Training.** Training in manual dexterity and technical information, given in connection with general education, and directed partly toward the acquirement of the skill and knowledge necessary for some trade, partly to the development of general mental capacity.

**Industry.** In modern economic language, industry includes all labor which contributes to the satisfaction of human needs. In older usage it frequently means manufacturing industry as opposed to agriculture and commerce; in a third sense, it refers to the production of material goods as opposed to intellectual or artistic labors.

**Inebriates,** RETREAT FOR. Institutions for the reception and treatment of habitual drunkards. There were seven such retreats in England in 1888 which cared for 99 patients. In the United States in 1887 there were 50 institutions with over 1,000 patients, some States compelling inebriates to undergo treatment. Ab. one-half of the inebriates in hospitals are cured.

**Inebriety.** See ALCOHOLISM.

**Ineptæ.** Group of Birds, including the DODO (q.v.).

**Inequation.** Algebraic statement that one quantity is greater or less than another. Its symbol is two intersecting lines > or < having the opening toward the greater quantity. Two inequations are in the same or opposite sense, as their signs open in the same direction or in opposite directions.

**Inequivalve.** Having valves unlike in form or size; *e.g.*, the Oyster.

**Inermes.** See ACHÆTA.

**Inertia.** One of the essential properties of matter. The name has been given to explain the observed phenomenon that matter resists an impulse which tends to change or arrest the direction of its motion, or to arrest it, or to start it moving from rest. It is proportional to the mass of a body. The moment of inertia of a revolving body is the product of its weight into the square of its RADIUS OF GYRATION (q.v.).—As applied to mental phenomena, incapacity of initiating motion.

**Inez de Castro.** See CASTRO, INEZ.

**Infallibility,** PAPAL. Doctrine, defined July 18, 1870, by Pius IX., at the Vatican Council, that the Pope, when speaking ex cathedra, *i.e.*, as the pastor and teacher of all Christians, is the organ of the infallible guidance promised by the Redeemer to His Church, in all doctrine of faith or morals. It is not to be confounded with Impeccability, which no one claims for the Pope.

**Infamous Crimes.** Those which subject the offender to a punishment which correct public opinion deems disgraceful. Formerly conviction of such a crime rendered the convict incompetent as a witness. This effect has been abolished generally by statute.

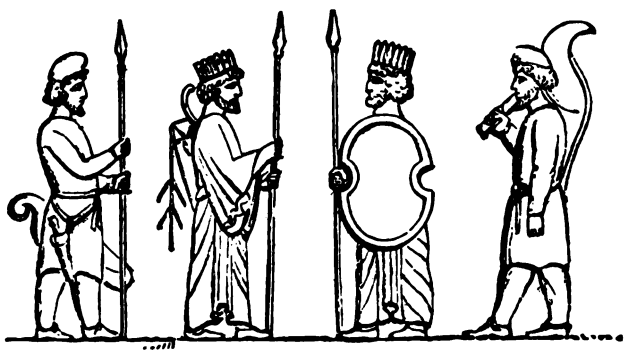
**Infant.** One whom the law declares incompent because of age. The period of non-age is not the same in all systems of jurisprudence. In English law it ends with the beginning of the day preceding the twenty-first birthday. The infant's disabilities are imposed as a protection, and the law strives to prevent his using them to the injury of others. As a rule an infant's contracts are voidable by him, but not by the adult contracting party. Non-age is not a defense to a tort or a crime, except in the case of the very young, nor to an obligation imposed by law, as to pay for necessaries.

**Infante.** In Spain and Portugal, any son of the King except the eldest or heir-apparent. Infanta is any royal princess except the eldest when heir-apparent.

**Infanticide.** Killing of a young child after its complete separation from the mother; a species of homicide.

**Infant Jesus,** DAUGHTERS OF THE. Order of Catholic nuns, founded by Anna Moroni of Lucca, for the industrial instruction of poor girls. No convent can have a membership greater than 33, the number of years Jesus lived on earth.

**Infantry.** Soldiers who march and fight on foot. Of the three arms of the service, this is the easiest to recruit, the simplest to instruct, and most economical to subsist and equip. It can operate independently, can march, maneuver, and fight on any ground, withstand greater fatigue, undergo greater privations, and in the long run outmarch even the cavalry. The Macedonian phalanx under Alexander overcame the Persian empire: the Roman legion conquered the then known world: the barbarian hordes that overwhelmed Rome were mainly infantry. After the feudal period, when for a time infantry was in disrepute, it was re-established by the Swiss at Montgarten and Lempach by the overthrow of the Burgundian and Austrian chivalry. The victories of Charles V. and Philip II. were due to the famous Spanish infantry, while in the revolutionary era the French infantry gained that experience and seasoning which made it the principal element of power in the armies of Napoleon. The first regularly paid regiment of infantry, organized by Charles VII. 1448, was armed with the long bow, crossbow and sword. The Swiss infantry was armed with pikes even up to 1703. The invention of firearms gave so great an advantage to infantry that its growth in importance may well date from 1648–53, when the bow and pike were superseded by the musket and bayonet, during the wars of the Fronde. The fusil or flint-lock musket came 1700, and continued in use down to ab. 1810, when the percussion-lock displaced it. Modern infantry is armed with the breech-loading small caliber rifled magazine guns, with an effective range of over 2,000 yards. The unit of combat of the infantry is the company: the battalion is the tactical unit and also the unit for instruction and discipline: the regiment is the unit of administration and control. The size of the companies varies in different services from 65 to 250; that of the battalion from 2 to 4 companies, the limit being the number of men that can be personally directed in its movements by one officer. The U. S. have 25 regiments of infantry, of which two are colored: they aggregate on a peace footing 877 commissioned officers and 13,125 enlisted men, giving in all 200 companies, each of 3 officers and 65 men.



Persian Foot Soldiers (Persepolis).

**Infantry,** LIGHT. Formerly troops that operated as skirmishers on the front and flanks and covered the heavily armed and more compactly organized infantry of the line: especially noticeable in the Napoleonic wars. The flank companies of a regiment were formerly drilled for such duties. All infantry in modern armies have the same armament, drill and organization.

**Infantry Tactics.** Means by which an officer forms infantry soldiers into an organized body which can be marched without confusion and with celerity to any desired point, maneuvered over any ground, thrown into the best particular formation for attack or defense, and yet be under the complete control of its commander. The accepted organizations for infantry are found in the drill regulations adopted by the War Department, as are also the formations required for the drill and discipline of an infantry force. But the tactical art is developed in a commander only when he can always bring a stronger force than the enemy at the time and place of actual combat on the field of battle.

**Infant Schools.** Originated by J. F. OBERLIN (q.v.), in France and in Scotland by R. Owen; now a department of all Sunday schools. A society, based on Pestalozzi's ideas, was formed in England 1836. See KINDERGARTEN.

**Infection.** 1. Communication of a disease from one person to another. 2. Material which gives rise to a disease. 3. Process of acquiring a disease.

**Infectious Diseases.** Essentially the same as contagious. Formerly they included those in which contact or intimacy with the sick was not necessary, the causal agent being transportable. Due to micro-organisms.

**Inference.** Logical process of deducing one proposition from another, or from several others, by means of middle terms. It renders explicit to the mind what is implicit in a given conception or proposition, and hence is simply the unfolding of implications.

**Inferior.** Ovary of a flower when it is adnate to the calyx, wholly or in part, and thus below it to a greater or less extent.

**Inferior Limit.** That from which the change of a function begins; or a constant value known to be less than any value of a variable. In the Theory of Equations it is a value known to be less than the least root of the equation.

**Inferior Planets.** Those whose orbits lie within that of the earth, as Mercury and Venus.

**Infernal Machines.** Machines of innocent appearance composed of powerful explosives, generally dynamite, so arranged that careless handling or the action of clockwork will cause them to explode with deadly effect; bombs thrown by hand are used for the same purpose. Attempts were made on the lives of Napoleon I. (1800), Louis Phillipe (1835), Napoleon III. (1858). Alexander II. of Russia was killed in 1881 by a bomb. The most infamous instance in America is that of Haymarket Square, Chicago, where several men were killed and many wounded.

**Infidel.** Unbeliever: term loosely and freely applied, as by Mohammedans to any not of their faith, so often by Christians to those of differing opinions. See ATHEISM, DEISM, and HERESY.

**Infiltration.** Purification of water by allowing it to filter through natural gravel beds into an intercepting gallery or

well. At Lowell, Mass., is an infiltration gallery 1,300 ft. long; at Columbus, O., one 600 ft. long. Although such galleries are usually built along river banks, they derive their supply mainly from the ground water. See FILTERS.

**Infinite.** Negatively, absence of limits in time, space, or other modes; positively, the Absolute, which lies at the basis of dependent and limited things.

**Infinite.** In Mathematics, a quantity greater than any assignable quantity. Its reciprocal is an infinitesimal. Its symbol is sometimes the same as that for absolute infinity $\infty$ In some discussion the symbol for infinitesimal with a negative exponent indicates an infinite and denotes its order; as, $\iota^{-1}$ $\iota^{-2}$, etc.

**Infinitesimal.** Quantity so conceived as to be necessarily less than any assignable quantity. Infinitesimals are considered as of different orders, according to the number of infinitesimal factors. The symbol is the Greek letter iota ($\iota$). An infinitesimal of any order vanishes when measured by a unit of the preceding order. Differential calculus is based by some upon the theory of infinitesimals, and hence called Infinitesimal Analysis.

**Infinity.** Absolute infinity is that beyond all possible limits. It can have no orders, and is represented by $\infty$.

**Infinity,** POINT AT. In Projective Geometry, point corresponding to a finite point when the projecting ray becomes parallel to the transversal.

**Infinity,** STRAIGHT LINE AT. Limiting position of the straight line expressed in trilinear co-ordinates as the ratios of linear parameters approach those of the sides of the triangle of reference. In Projective Geometry this line is the intersection of parallel planes.

**Inflammation.** Condition in which there is more or less congestion of a part with a tendency to the escape of the elements of the blood into the tissues or upon their surfaces. Exudation may consist of pus, mucus (catarrhal), material for the reconstruction of tissues after injury, or of a membrane, as in diphtheria. When severe, it is accompanied by heat and redness of the part, pain, and an increase in bodily temperature. It is the normal process for the repair of injured or destroyed tissue, and abnormally is the result of the presence of some morbific material in the system, or of an injury.

**Inflation.** Permanent excess of the circulating money of a country over that country's distributive share of the money of the commercial world.

**Inflection.** Variations in form of words to indicate the relations of the words involved in any sentence. Inflections thus take the place of distinct relation-words in isolating languages and of the semi-independent relation element in agglutinative languages.

**Inflexion.** Point at which a curve changes from concave to convex, or the reverse. To determine points of inflexion for a curve $y=f(x)$, find the second differential coefficient in terms of x, equate this with zero and infinity: the roots of these equations will be critical values. If the second differential coefficient changes its sign in passing through any one of these values of x, that is the abscissa of a point of inflexion.

**Inflexional Languages.** The power to express grammatical or formal relations not by the mere addition of other words to the word in question, root or stem, but by a change within the root or stem itself, distinguishes the higher groups of languages. Thus the plural of *man* is expressed by a change of vowel, *men;* further, a root or word once added to another word loses its independence and becomes a merely inflexional syllable, as *-ly* in adverbs from the word *like*, or as the endings which express case, person and number. In the widest sense, all languages except Chinese, and related dialects, are inflexional; but the power to join two roots and make each lose its independence in a new combination is limited to the Aryan and Semitic groups.

**Inflorescence.** See ANTHOTAXY.

**Inflorescence,** DEFINITE. See CYMOSE.

**Inflorescence,** INDEFINITE. See BOTRYOSE.

**Inflorescence,** INDETERMINATE. See BOTRYOSE.

**Influenza.** Epidemic affection, popularly termed grip or la grippe, in which there is inflammation of the air passages, causing running at the nose, cough, and all the symptoms of a cold, accompanied by severe pain in the head, back, muscles, etc., fever, and extreme weakness, which may last for weeks after subsidence of the acuter symptoms. Pneumonia and inflammatory affections of the eye or ear may accompany an attack. Restoration to health is slow; one attack does not preclude the occurrence of another; relapses are frequent, and in the feeble and at the extremes of life are dangerous. The disease is of recent introduction into the U.S., usually prevails during the damp weather of winter and spring, is slightly contagious, and is probably due to a micro-organism.

**Information.** Charge against one or more persons, in a proceeding instituted by the government, written and sustained by the oath of an authorized public officer; infrequently employed in the U.S.

**Informer.** One authorized by law to prefer an accusation against another for the violation of a penal statute. He is often entitled to a part of the penalty in case of conviction.

**Infra-Œsophageal Ganglia.** Nerve centers lying on the ventral side of the œsophagus; best developed in Annelids and Arthropods, in which groups they form a ventral nerve-chain.

**Infrastapedial.** Process of the columella auris.

**Infula.** Wreath worn by the Romans on festive and solemn occasions, composed of a flock of red and white wool. In sacrificing it was tied to the head of the victim. The cut shows a clerical infula copied from a brass in a church in Surrey, England.

Infula

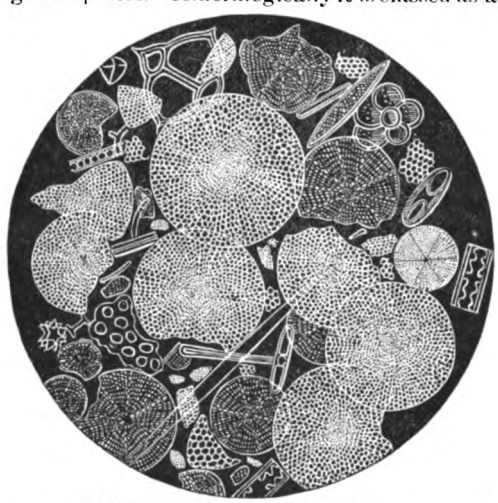
**Infundibuliform.** Funnelform corolla of many flowers, as those of the Morning Glory.

**Infundibulum.** 1. Gastric cavity (stomach) of Ctenophores. 2. Funnel or siphon of Cephalopods.

**Infusion.** In Medicine, preparation made by pouring a hot or cold liquid upon a substance whose medical virtues it is desired to extract.

**Infusoria** (STOMATOPHORA). Group of corticate *Protozoa*, having a body of fixed form without a shell or skeleton (at least in the free-swimming forms), and having definite organs for prehension and locomotion. Mouth and anus are usually present, and often more than one nucleus and contractile vesicle. They are the microscopic forms usually swarming in infusions and stagnant waters. There are three sub-groups, the FLAGELLATA, CILIATA, and ACINETARIA (q.v.).

**Infusorial Earth.** Earthy tripoli, or fossil flour, a fine-grained, earthy mass, resembling clay or chalk. It consists essentially of the siliceous shells of diatoms and other microscopic organic species. Mineralogically it is classed as a variety



Infusorial Earth under Microscope.

of opal. In the U. S. extensive deposits are known in Md., Va., Cal., Ore. and Nevada. Its principal value is as abrasive material, though it was formerly much used, especially in Germany, as an absorbent of nitro-glycerine in the manufacture of dynamite.

**Ingalls,** JOHN JAMES, LL.D., b. 1833. U. S. Senator from Kansas 1873–91; noted as an orator.

**Ingalls,** RUFUS, U.S.A., 1820–1893. Chief-quartermaster Army of the Potomac 1862–65; Brig.-gen. U. S. Vols. 1863; retired 1883.

**Ingelow,** JEAN, b. 1820. English poet, novelist, and writer of juvenile tales. *Off the Skelligs*, 1872; *Don John*, 1876.

**Ingemann,** BERNHARD SEVERIN, 1789–1862. Danish poet, dramatist, and historical novelist. *Bianca*, 1815; *Valdemar Seir*, 1826.

**Ingenhousz,** JAN, F.R.S., 1730–1799. Dutch-English physician, noted for chemical and botanical researches.

**Ingersoll,** ERNEST, b. 1852. American ornithologist.

**Ingersoll,** JARED, 1749–1822. Twice Atty.-gen. of Pa.; Judge

Phila. district court: Federalist nominee for Vice-Pres. 1812.—His son, CHARLES JARED, 1782–1862, was M. C. 1813–15, U. S. District-atty. 1815–29, again in Congress 1841–47, and historian of the War of 1812, 4 vols., 1845–52. *Inchiquin's Letters*, 1810. —His brother, JOSEPH REED, LL.D., D.C.L., 1786–1868, was M. C. 1835–37 and 1843–49, Minister to England 1852–53, and prominent at the Phila. bar.—His cousin, RALPH ISAACS, 1788–1872, was M.C. from Conn. 1825–33, and Minister to Russia 1846–48.

**Ingersoll,** ROBERT GREEN, b. 1833. American lawyer and lecturer, noted for eloquence and opposition to received religious opinions. *The Gods*, etc., 1878; *Mistakes of Moses*, 1879.

**Ingham,** BENJAMIN, 1712–1772. English evangelist, founder of a small sect, the Inghamites, chiefly in Yorkshire, now nearly extinct.

**Ingleby,** CLEMENT MANSFIELD, LL.D., 1823–1886. English writer, mainly on Shakespeare. *Essays*, 1888.

**Ingluvies.** Crop of birds.

**Ingoldsby,** THOMAS. See BARHAM, R. H.

**Ingolstadt.** Town of Bavaria, on the Danube, 53 m. n. of Munich; long the seat of a noted university, founded 1472, removed 1800 to Landshut and 1826 to Munich. Its fortifications were razed 1800 by the French, and restored 1827–30. Pop., 1890, 17,646.

**Ingot Metal.** One which in the process of fabrication has been fused and poured into an ingot mold. The result of the fusion is that impurities are separated by differences in specific gravity, and greater homogeneity is secured. The dangers arise from pipes or hollow centers, from blow-holes, and from cracks.

**Ingraham,** DUNCAN NATHANIEL, 1802–1891. U. S. naval officer. In 1853, at Smyrna, he protected M. Koszta, a Hungarian-American, arrested by the Austrian consul. He became chief of the Ordnance Bureau 1856, and later Commodore C.S.N.

**Ingraham,** EDWARD DUNCAN, 1793–1854. Lawyer of Phila. *English Ecclesiastical Reports*, 7 vols., 1809–35; *Insolvent Laws of Pa.*, 1827.

**Ingraham,** JOSEPH HOLT, 1809–1860. American novelist. *Prince of the House of David*, 1855; *Pillar of Fire*, 1859; *Throne of David*, 1860.

**Ingres,** JEAN AUGUSTE DOMINIQUE, 1780–1867. French painter of great celebrity, but not of eminent genius, as judged by his most accessible works in Paris.

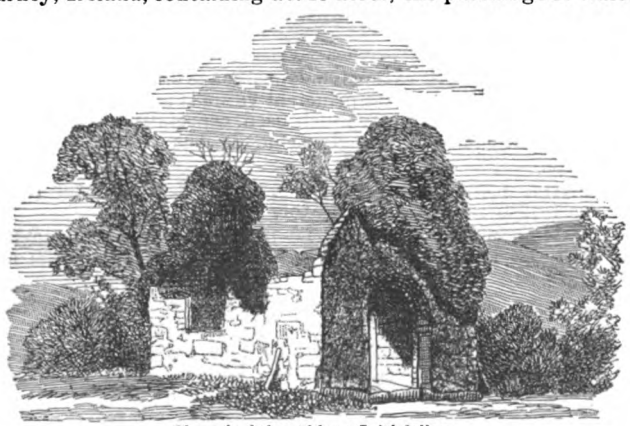
**Ingulph,** d. 1109. Abbot of Croyland in Lincolnshire; reputed author, in whole or part, of a Latin history of that monastery, pub. 1596 and 1684, tr. 1854. Some give the work a later date.

**Inhalent Pores,** or INHALENT OSTIA. Small openings, as in the wall of sponges, through which water is drawn into the cavities of the body for nutritive and respiratory purposes. See INCURRENT CANALS.

**Inheritance,** HEBREW. Landed property was divided, as of right, equally among all the sons, except that the eldest counted for two. Daughters inherited only in default of males, and then could not marry out of their tribe. Movables and money appear to have gone according to the father's will.

**Inhibition.** Peculiar tendency to arrest, exhibited by all nervous reactions; that is, any nervous activity tends to be neutralized up to a certain point. The neutralizing or inhibiting factor, unless it be the direct action of the will, is usually another nervous impulse arriving at the center.

**Inishfallen,** or INNISFALLEN. Islet in Lower Lake of Killarney, Ireland, containing ab. 18 acres, the pasturage of which



Chapel of the Abbey, Inishfallen.

is celebrated for fattening cattle. The Abbey of Inishfallen was founded in the 6th century by St. Finian, but the ruins there now are evidently of a later date.

**Initial Line.** Position from which a revolving line begins its revolution; that side of an angle from which its measurement begins. This and the pole are generally the elements of reference in polar co-ordinates.

**Initial Plane.** Face of a dihedral angle from which its measurement begins; fixed position from which the revolving plane moves in forming the dihedral angle.

**Initials.** Signing legal documents with initials is in most cases as binding as when the full Christian name is used.

**Initial Velocity.** That of a projectile on leaving the muzzle of the gun. By means of ballistic machines or chronographs the exact instants that a projectile cuts the wires of several targets at known distances from the gun are found; from these the time of passing over a known distance is found, and the mean velocity is computed at any point from the muzzle outward. Recent experiments at Fort Monroe, made by Prof. Chrene and Lieut. Squier with a new chronoscope of their invention, have enabled them to obtain much more accurate values of the velocity, and at nearer distances to the muzzle than ever before. From these it has been proved that the maximum velocity does not occur at the muzzle, as has heretofore been assumed, but at a point varying from six to eight feet beyond the muzzle. This shows that the powder gases exert an accelerating influence upon the projectile after it leaves the gun.

**Injection.** Water which is forced by atmospheric pressure from the cold-well into the condenser of a CONDENSING ENGINE (q.v.) in which the condensation of the exhaust steam is effected by direct contact of the steam and water. A valve controls the rapidity of the injection, lest the condenser should be filled or drowned by excess of water. See CONDENSER.

**Injector.** See GIFFARD'S INJECTOR.

**Injunction.** Judicial order prohibiting the commission or prosecution of an act, or commanding restoration: introduced by equity courts from the Roman law; not employed where adequate relief can be obtained in a common law suit. The subject is now regulated largely by statute. It is most frequently employed to restrain trespass or waste; to prevent or abolish nuisances; to restrain the infringement of patents or copyrights, and to prevent debtors from conveying property in fraud of creditors.

**Injury,** IN ETHICS. Infraction by one person of another's rights.

**Ink.** The commonest black ink is made by heating ferrous sulphate (copperas) with an infusion of gall nuts, exposing this to the air, and then adding gum, sugar, or glycerine. Watts gives the following formulæ for black ink:

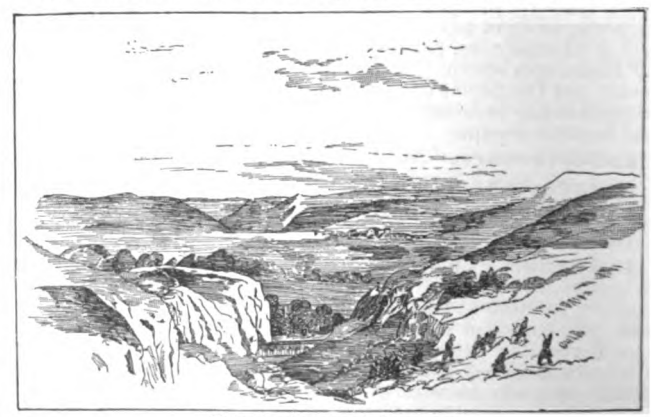
| | *a* | *b* | *c* | *d* | *e* | *f* | *g* | |
|---|---|---|---|---|---|---|---|---|
| Galls | 225 | 187 | 133 | 125 | 66 | 62 | 31 | to 1.000 parts of water. |
| Copper | 75 | 73 | 55 | 24 | 22 | 31 | 19 | |
| Gum Arabic | 25 | 73 | 55 | 24 | 19 | 31 | 8 | |

*d*, *e* and *f* are best adapted to ordinary use. Copying inks are ordinary inks in more concentrated form, to which more sugar or glycerine has been added. Red inks are made from either cochineal, Brazil wood, or eosin. Blue ink is usually made from Prussian blue, oxalic acid, and water. Indelible ink contains silver nitrate as an essential constituent. Printer's ink is composed of carbon in the form of lamp-black, boiled and burned linseed oil, rosin, turpentine, and soap.

**Ink,** SYMPATHETIC. See COBALT CHLORIDE.

**Inkberry.** *Ilex glabra.* Shrub of the Holly family, bearing fleshy, black berries, native of the e. U.S.

**Inkermann.** Ruined village in the Crimea, near the e.



Vale leading to Inkermann

extremity of the harbor of Sevastopol. In a battle fought here Nov. 5, 1854, some 60,000 Russians were repulsed by 14,000

British and French, leaving 9,000 killed and wounded; loss of Allies, 2,200.

**Inlaying.** Art of decorating surfaces by inserts of another color or material. Wood, steel, gold, brass, ivory, pearl, shell, bone, stone, and marble have all been used for the purpose. Byzantium, Damascus, India, China and Japan have excelled in this work. Russia, Italy and the East are still noted for their skill in inlaying.

**Inman,** HENRY, 1801–1846. American portrait painter, in England ab. 1842–45.

**Inn.** See HOTEL.

**Inn.** River which rises in the Swiss Alps, flows through Tyrol and Bavaria, and joins the Danube at Passau: length 317 miles.

**Innate.** Mode of attachment of the anther of a stamen to the filament, in which the anther-cells are separated by a connective of greater or less width.

**Innate Ideas.** Such as are not acquired by sense experience. Their existence is a disputed point.

**Inner Temple.** See INNS OF COURT.

**Innervation.** Nerve supply of a bodily organ; also, act of transmitting nervous energy into an organ, particularly a muscle.

**Innes,** COSMO, 1798–1874. Prof. Edinburgh 1846. *Scotland in the Middle Ages*, 1860; *Early Scotch History*, 1861; *Legal Antiquities*, 1872.

**Innes,** THOMAS, 1662–1744. Scottish priest, in Paris from 1701. *Ancient Inhabitants of Scotland*, 1729, repub. 1853 with his incomplete *Hist. Scotland*.

**Inness,** GEORGE, 1825–1894. American landscape painter, distinguished for broad methods and serious purpose.

**Innkeeper.** One who keeps a house of entertainment for transient guests: he differs from a boarding-house keeper in that his house is public, and from a restaurateur in that he lodges his guests. It is often difficult to decide whether a particular patron is a guest or a boarder; but as a rule the guest does not make a contract for a specific period. The innkeeper's responsibility to his guest is very severe, extending to all injury to the latter's goods, unless caused by the owner's fault, the act of God, or of the public enemy. This liability has been modified by statute in most jurisdictions. He has a lien on all goods brought by the guest to the inn as his own, for the entire bill.

**Innocent I.,** ST. Bp. of Rome 402–417.—II. Gregorio Papareschi, pope 1130–43; driven from Rome by Anacletus II., antipope 1130–38.—III. Lotario Conti, 1160–1216, cardinal 1190, pope 1198. He carried the papacy to its height of power; received the homage of England, laid an interdict on France, crushed the Albigenses, and oppressed the Jews. Also Landus, antipope 1179–80.—IV. Sinibaldo de' Fieschi, pope 1243–54, a

Innocent X.

learned canonist, at war with the Ghibellines.—V. Peter of Tarantasia, 1225–1276, a Savoyard, called "Most famous Doctor"; Abp. of Lyons 1272, pope 1276.—VI. Etienne Aubert, a Fleming, Bp. of Noyon, pope at Avignon 1352–62.—VII. Cosmo Migliorati, Abp. of Ravenna, pope at Rome 1404–6, rival of Benedict XIII. of Avignon.—VIII. Giovanni Battista Cibo, 1484–92, a pontiff of evil record.—IX. Giovanni Antonio Facchinetti, 1591.—X. Giovanni Battista Pamfili, 1574–1655, pope 1644, noted for simony and opposition to Jansenism.—XI. Benedetto Odeschalchi, 1611–1689, pope 1676: he opposed Louis XIV. and revoked the liberties of the Gallican Ch.—XII. Antonio Pignatelli, 1615–1700, Abp. of Naples 1681, pope 1691, a reformer at home and reconciler of the Gallicans; celebrated in Browning's poem, *The Ring and the Book*.—XIII. Michel Angelo Conti, 1655–1724, Bp. of Viterbo 1712, pope 1721; opponent of the Jesuits.

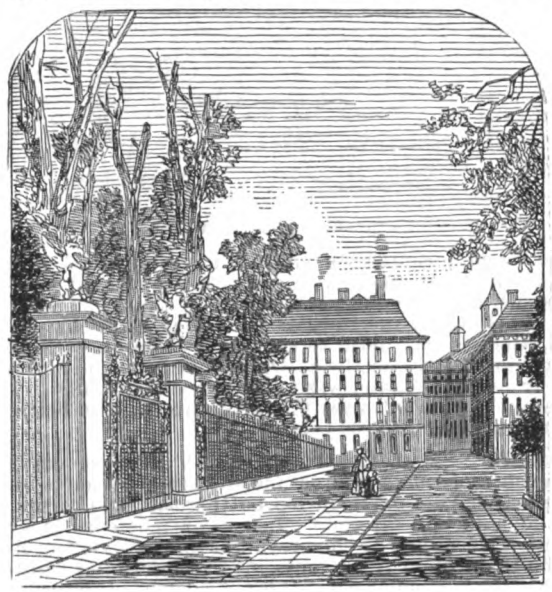
**Innocent's Day.** Dec. 28, in honor of the babes of Bethlehem killed by Herod.

**Innominate Bone.** Irregular bone which, with its fellow of the opposite side and the sacrum, forms the pelvis; made up of the ilium, ischium, and pubic bone, which are distinct at first, but fuse in early life.

**Innovation.** Process of renewal of growth at the apex of certain plants, as many mosses, while the older portions below decay away.

**Innsbruck.** Capital of the Tyrol, on the Inn; taken by Maurice of Saxony 1552, by Bavarians 1703, by French and Bavarians 1805, and by the Austrians Aug. 12, 1809. Its univ., founded 1677, reorganized 1826, has ab. 75 teachers and 700 students. Pop., 1890, 23,326.

**Inns of Court.** Corporate societies in London authorized to instruct and examine for admission to the bar; also their buildings, the Inner Temple, Middle Temple, Lincoln's Inn, and



Gray's Inn—Gateway to the Garden.

Gray's Inn. The first two once belonged to the Knights Templars. The benchers, the highest of the four grades of members, have the power of admitting to the bar, and of disbarring at their discretion, but an appeal may be taken to the judges.

**Innuit,** or INUIT. Native name of the ESKIMO (q.v.).

**Ino.** Daughter of Cadmus; foster-mother of Bacchus; turned into a sea-nymph.

**Ino,** CHUKEI, 1744–ab.1825. Japanese surveyor and scientist. *Latitudes and Longitudes*, 1818.

**Inoperculata.** See PULMONATA.

**Inosite.** $C_6H_{12}O_6$. Mpt. 150°–160° C. Carbohydrate of the glucose group, found in the animal organism and in many plants, such as unripe beans, peas, etc.; white crystals, with a sweet taste.

**Inouye,** KAORU, COUNT, b. 1839. Japanese Foreign Minister 1880–87; ennobled 1885; Minister of the Interior 1892.

**In partibus Infidelium.** In R.C. Ch., part of the title of bishops who have no jurisdiction, their sees being in lands once Christian, but now usually Mohammedan.

**In Personam; In Rem.** Terms applied to legal rights or proceedings. A right is *in personam* when it exists against particular individuals, as the right of the holder of a note against the maker: it is *in rem* when it exists over a particular thing against all the world, as the right to a coat. An action *in rem* proceeds against certain property, as against a ship, or as against goods libable to forfeiture; one *in personam* has a definite person as a defendant.

**In Place.** Rock in its natural position in the earth's crust; distinguished from detritus or fragments that have been broken off and transported.

**Inquest,** CORONER'S. See CORONER.

**Inquest of Office.** Procedure by which the Crown or the State obtained possession under a judicial decision of lands or chattels; rarely employed in the U. S.

**Inquisition,** or HOLY OFFICE. Court of inquiry into heresy and spiritual offenses. These were punished capitally to some extent in the 4th century, and inquisitors were appointed by Theodosius 382. The synodal courts assumed jurisdiction in such cases ab. 800. Innocent III. brought these courts under papal direction 1215. The Inquisition was established as a separate institution and committed to the Dominicans by Gregory IX. 1231. The torture was used, and various penalties

Torture Used in the Inquisition.

affixed, from forfeiture of civil and ecclesiastical rights to burning alive. It was introduced into France, but compelled to operate furtively, and suppressed by the Edict of Nantes 1598. In Germany and Italy its operations were restricted. In Spain, where it was most terrible, it became an ecclesiastico-political institution for the extirpation of Jews and Mohammedans by Auto-da-fé, and was not suppressed till 1808. In the Netherlands, under Charles V. and Philip II., it is believed to have executed over 50,000 persons.

**Insanity,** LEGAL CONSEQUENCES OF. It is generally held that a contract between an insane and a sane person is voidable at the former's option, upon his putting the sane person (if he acted bona fide) in statu quo. Insanity is a defense in a criminal action, according to the prevailing modern view in Britain and the U. S., when it prevents his distinguishing right from wrong in the particular act. It is not a defense to a tort action, unless a specific intent is of the essence of the wrong.

**Inscribed Angle.** In an arc, when its vertex is on the arc and its sides limit the arc.

**Inscribed Figure.** One whose elements terminate in or are embraced by the elements of the circumscribing figure.

**Inscribed Line.** One which has its extremities in the circumscribing boundary.

**Inscriptions.** Writings preserved through the permanence of the stone or metal on which they are graved have a special significance to the historian and the student of language or art. After China the oldest inscriptions are found in India and Egypt, and then follow those of Assyria and Babylonia, Persia and Media, Phœnicia, Greece and Rome. Inscriptions like those of the trilingual Rosetta-stone have in a number of instances led to the decipherment of languages long forgotten.

**Insecta-Discota.** Insects with imaginal disks; inactive in the pupa stage.

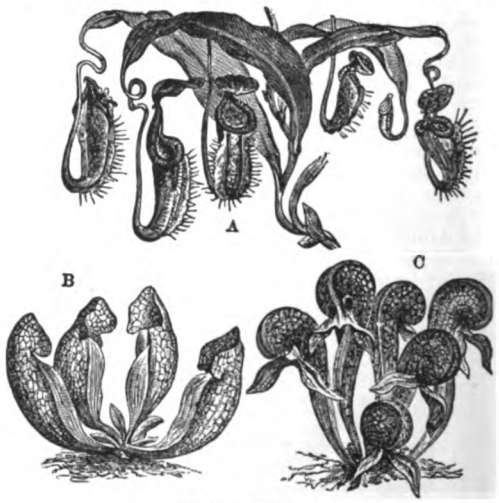
**Insect Fertilization.** Fertilization of flowers by the agency of insects, which, attracted by nectar, come in contact with the stamens and pistils and so carry the pollen which adheres to their bodies from one to the other.

**Insecticides.** Means of destroying insects. Arsenites (Paris green or London purple) may be applied dry, 1 part to 30 of lime, dust, or ashes; or liquid, 1 part to 100 or 200 of water; effective against insects that chew. Bisulphide of carbon may be poured into the ground to kill subterranean species. For root insects, 1 part carbolic acid to 50 of water may be used. White hellebore powder is used for the currant worm. Water at 125° F. and strong soap-suds may be used against plant lice. For other sap-sucking insects use kerosene emulsion (soap ½ lb. dissolved in 1 gal. of water, with kerosene 2 gal. diluted 10 to 15 times with water). Fresh pyrethrum powder, or kerosene extract of pyrethrum, may be used for insects on cabbages, celery, lettuce, etc. For scale insects use 1 part soda to 8 of resin, dissolved and diluted 30 times. Oil of tar in fish oil may be used to anoint cattle with, to drive off flies. Tobacco dust or decoction is effective against ticks, flea-beetles, etc. Corrosive sublimate in alcohol, one grain to the ounce, kills bed-bugs. Phosphorus rat poison kills roaches.

Mode of Applying Insecticides.

**Insectivora.** 1. Group of EDENTATA (q.v.). 2. Sub-order of *Bunotheria* (sometimes considered an order when the numerous Eocene mammals classified as sub-orders of *Bunotheria* are all included). In a restricted sense, the group is characterized by large, simple incisors, not growing from persistent pulps; small canines; sharp pointed molars; unguiculate, plantigrade feet; deciduate discoidal placenta; presence of clavicles and small smooth brains. They are nocturnal, often subterranean in habit; they feed on insects and worms, and in temperate countries hibernate. Some include the *Dermotea* family, *Galeopithecidæ*. Besides this, there are eight families, including the Hedgehogs, Shrews, and Moles; viz., SORICIDÆ, TALPIDÆ, CHRYSOCHLORIDÆ, POTAMOGALIDÆ, CENTETIDÆ, ERINACEIDÆ, TUPAIIDÆ, and MACROSCELIDÆ (q.v.). There are no *Insectivora* in S. America nor Australia.

**Insectivorous Plants.** Those provided with organs so




Pitcher-Plants.
A, *Nepenthes Phyllamphora;* B, *Sarracenia purpurea;* C, *Darlingtonia californica.*

modified as to entrap and digest insects, as the Sundew, Venus Fly-trap and Pitcher Plants.

**Insect Powder.** See PYRETHRUM.

**Insects** (INSECTA). Term used generally as synonymous with HEXAPODA (q.v.), but often, and more broadly, of equal scope with TRACHEATA (q.v.). The term is also ignorantly used for any animal of very small size.

**In Series.** See BATTERY, ELECTRIC.

**Insessores.** Perching Birds, including the Raptatores, Passeres, and Scansores; also equivalent to the Passeres in a broad sense, including also certain scansorial forms.

**Inside Gear.** See ANNULAR WHEEL and GEAR WHEELS.

**Insidentes.** Legs of walking birds, having the inner toe behind, and three forward, united by a short membrane at the roots.

**Insistent Ideas.** Such as return spontaneously and constantly, inciting to action often of an absurd or detrimental sort, the undesirableness of which is usually recognized and its performance checked by the patient. They are characteristic of

certain forms of insanity, but may also be present in an otherwise sound mind. See FIXED IDEAS.

**Insolation.** Exposure of objects to sunlight to destroy the bacteria which may be on them.

**Insolvency.** Inability to pay one's debts as they mature. Insolvency statutes, in Gt. Britain, formerly had for their primary object the debtor's discharge from imprisonment, but not from his debts. They are now in substance a part of bankruptcy legislation. In the U. S. they differ widely in the various States.

**Inspector-General's Department.** Its chief, a military officer with the rank of brigadier-gen., is located in Washington at the War Department. Under him are two colonels, two lieut.-colonels, and two majors. Other officers may be temporarily appointed. Their duties are to exercise a comprehensive and general observation within their respective districts over all that pertains to the efficiency of the army, the condition and state of supplies of all kinds, of arms and equipments, of the expenditure of public money and property, and the accounts of all disbursing officers of every branch of the service, of the conduct, discipline and efficiency of officers and troops, and to report as to all irregularities that may be discovered. From time to time they will make suggestions for the cure of any defects they may observe.

**Inspiration.** In Scripture, that peculiar fullness of Divine illumination which makes the words of man in a pre-eminent degree the vehicle of the mind of God. Of this, as of other important doctrines, varying theories have been held, some of them now antiquated; none of them succeed either in explaining, or in explaining away, the apparent fact.

**Installation.** Ceremony of putting an Anglican or Episcopal clergyman in possession of his office. Institution and Induction have nearly the same meaning.

**Instantaneous Center.** The motion of any body in one plane can be considered as a rotation around an instantaneous center in that plane. If the direction of motion of two points be taken at any instant, the intersection of perpendiculars to those directions locate a point which can be treated as a center for that instantaneous rotation. It can be proved that all other points in the plane were for that interval rotating around that same center. This principle is much used in the problems of Kinematics and Machinery.

**Instinct.** Complex though definite and usually involuntary reaction to stimuli of environment; innate tendency of animals, under given conditions of environment, to react in certain definite ways toward the attainment of certain definite ends, these ends being often if not always unrecognized by the animal. Instincts are thus usually spoken of as unintelligent. Their origin is doubtful. They may have arisen by the preservation by habit in successive generations of activities originally intelligent, or by natural selection, preserving originally unintelligent activities which were useful to the organism.

**Institute of France.** Organized in 1795, it has been modified by the changes in the national government, yet has survived them all. It is now divided into 5 academies, each having its own officers, methods, and publications: 1. Academie Française; 2. Academie des Inscriptions et Belles-Lettres; 3. Academie des Sciences; 4. Academie des Beaux-Arts; 5. Academie des Sciences morales et politiques. Each year on Oct. 25 the Institute holds a general meeting. The yearly salary given each member is 1,500 francs, of the secrétaires perpetuels is 6,000 francs.

**Institution of Civil Engineers.** Society in England, founded 1818 by Thomas Telford. It has nearly 7,000 members, and publishes annually four volumes of proceedings.

**Instrumenta Cibaria.** Mouth-parts of insects.

**Instrumentation.** See ORCHESTRATION.

**Insulator.** 1. Non-conductor of electricity: *e.g.*, shellac, hard rubber, glass. 2. Glass supports for electric wires.

**Insurance.** Contract by which one party agrees to indemnify another against certain risks to life or property; also sum to be paid by the insurer to the insured in case of loss by fire, shipwreck, or other casualty, on condition of previous periodical payments by the latter. The amount is calculated from the average frequency of loss by the casualties contemplated. In the case of life insurance, the premium or regular payment is a sum which will produce the amount of the insurance if the insured lives the average number of years, in addition to paying ordinary expenses and profits. Insurance against risk also enters in an economic sense into the total cost of production of goods, into ordinary business profits, into interest, and the rate of exchange. The insured must have a legal pecuniary interest in the person or thing covered by the policy. Representations in the application for the policy are generally declared by the policy to be warranties, in which case their untruth will avoid the contract, without regard to their good faith or materiality; but if they are representations merely, they will not avoid it unless willful or material to the risk. The assignability of a policy is generally regulated by the agreement of the parties.

*Marine Insurance.*—This long preceded that against fire or upon lives. A system of loans upon cargoes and vessels was in operation at Athens before the time of Demosthenes. The premium varied from 10 or 12½ per cent for an outward voyage, to 20, 25, or 33⅓ for the voyage out and home. Fraud in these contracts was punished by doubling the amount to be paid, and sometimes with death. At Rome the money-lender might demand any interest he pleased so long as the ship was at sea, but only 12 per cent after she had reached harbor. Maritime Insurance was regulated by law at Barcelona as early as 1435. The practice is said to have been general in Italy by 1200 and in England by 1550. Even among the Anglo-Saxons there were guilds which lent money without interest to such of their members as had suffered loss by fire, water, robbery, or other calamity; others contributed money if a member's house was burned. An English law of 1601 affirms that assurance had been practiced in the kingdom "tyme out of mynd." The Lombards were then famous as insurers of marine ventures.

*Fire Insurance.*—The great fire of London in 1666 compelled attention to some systematic provision for the relief of sufferers from fire, but no regular insurance office was opened till 1681. The "Hand-in-hand" company dates from 1696, and 5 others which still exist were organized 1700–50. The dates of the earliest fire offices are, for Scotland 1720; Germany 1750; U. S. 1752 (at Phila., Franklin a director); France 1816; Russia 1827. In Great Britain the business was taxed from 1694 to 1869. At first the companies themselves employed watermen to quench fires. They long maintained engines in the larger towns, but from 1866 have regarded the prevention of loss as the business of the public. The first year's business of the Phila. office covered $108,360, at an average rate of 1½ per cent. The total of risks written in 1894 in U. S. is estimated at $16,000,000,000; losses paid, $94,646,618.

*Life Insurance.*—Annuities seem to date from an early period. The methods of calculation used before the third century were extremely crude. The first to apply correct mathematical principles to the valuation of human life was Johan De Wit, grand pensionary of Holland, whose report to the States-General on life annuities was made 1671. In England, risks were taken upon lives for short periods by private underwriters in the 16th century. Casualty assurances seem to have been devised originally in the 17th century to provide ransom-money for such pilgrims or travelers as might be taken by pirates. These soon degenerated into insurance wagers or bets, and were forbidden by law. Ab. 1700 several companies were formed to secure annuities to the widows and orphans of subscribers. In 1706 a society was chartered which aimed to distribute a certain sum among the representatives of those who had died within the year. In 1734 they undertook to guarantee £100. All ages were rated alike. The Equitable, the first society which took account of differences of age, began business 1762: in 1800 Great Britain had 8 societies, in 1880 107, with a total of assurances in force of £420,000,000. A scheme for obtaining annuities and insurance of a limited amount through the General P. O. went into effect 1865.

Nowhere has the business of Life Insurance been developed so extensively as in the U. S. For a time after 1865 it increased with unexampled rapidity; in 1864 the total of insurances in companies which reported to the N. Y. Insurance Dept. amounted to but $395,703,058; in 1867 to $1,161,729,776; in 1871 to $2,023,884,955; Dec. 31, 1894, to $5,566,166,664, in 56 companies; in 350 assessment companies and orders $7,482,286,000.

The insurance of men's lives (that for ransom of captives excepted), was prohibited in the Netherlands 1570, in Genoa 1588, in France 1681. The oldest French life company was founded in 1819.

**In Surface.** Multiple arc. See BATTERY, ELECTRIC.

**Insurgents.** Soldiers or others in a state of insurrection against the civil or political authority; also Hungarian militia when called out for extraordinary service to the nation.

**Insurrection.** Rising in opposition to the established government, for the purpose of securing a redress of grievances, or to overthrow the constituted authorities. If unsuccessful, it becomes rebellion; if successful, revolution.

**Intæniolata.** See HYDROMEDUSÆ.

**Intaglio.** Converse of a cameo, or raised relief carved on a gem; design hollowed out, so as to make a raised impression when used as a seal. The term is applied to gem-cutting, and to gems so cut.

Roman Signifer.

**Intake.** Passage by which the ventilating current of fresh air enters a mine.

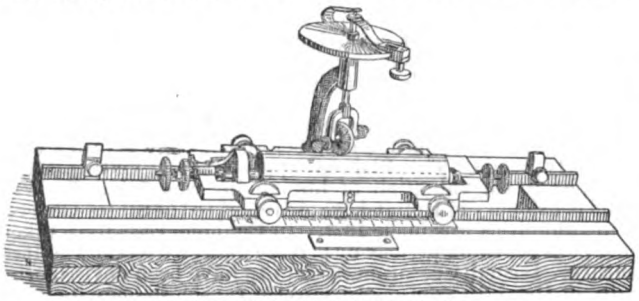
**Integer.** Whole number; distinguished from a fraction.

**Integral,** IN ARITHMETIC. Not fractional.

**Integral,** IN CALCULUS. That function which, differentiated, will produce the given differential expression. The sign of an integral is $\int$. Integrals are general or indefinite when no limits are assigned to the variable and the constant remains undetermined. Definite integrals are those in which (1) the inferior limit of the variable is fixed, or (2) both limits are assigned. In the definite integral the constant is determined for the limits assigned. The effort to integrate complicated differential functions, especially by means of series, has produced special forms which are grouped under distinctive names and treated as subjects of separate discussion.

**Integral Calculus.** That which treats of integration and discusses problems which involve integrals.

**Integration.** Process of ascertaining what function, differentiated, would produce a given differential. Primary formulas of integration are reversed statements of known forms of differentiation. Secondary formulas are algebraic transformations to place the given differential under primary forms. Complete integration is not always possible.


Abakanowicz's Totalizing Integrator.

**Integripalliata.** Group of siphoniate Lamellibranchs, including forms having the impression of the line of attachment of the mantle to the shell, as a simple line, nearly uniformly distant from the edge at all its points. Here are included the CARDIIDÆ (Cockles), and CYPRINIDÆ (q.v.).

**Integrity.** Truthfulness and honesty in act, word, and intention; complete consistency of external acts and internal thoughts and intentions.

**Integument.** Skin, exoskeleton, or outer covering of animals.

**Intellect.** Cognitive side of consciousness; thinking part of mind, as contrasted with the emotional and volitional; means by which we remember, reproduce, compare, exercise judgment, and reason. Various attempts have been made to classify the powers of the intellect; *e.g.*, memory, reason, and imagination, or discrimination, retentiveness, and similarity; but none are satisfactory. See PSYCHOLOGY.

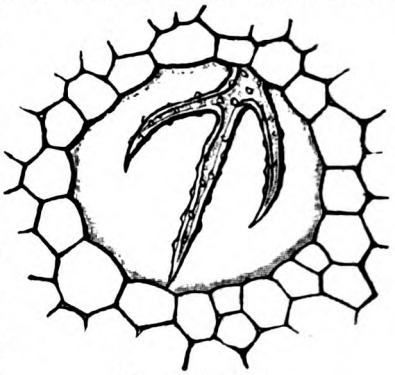
**Intensive Agriculture.** System of farming in which a relatively large amount of capital and labor is expended upon a small area, expecting the return to be proportional to the amount of capital invested, not to the extent of the land alone.

**Interambulacral Ossicles.** Bones or plates that make up the shell of Echinoderms; situated in zones between and alternating with the ambulacral zones.

**Interbreeding.** See HYBRIDIZATION and IN-BREEDING.

**Intercalary.** Growth of cells in organs already formed, as in the stems of certain plants.

**Intercellular Spaces.** Regions within the tissues of plants or animals which are devoid of cells. They contain air or water, or may be the receptacles of effete secretions.


Intercellular Space.

**Intercept.** Part of a line limited by a given locus. It refers commonly in Analytical Geometry to parts cut off by a locus on the axes of reference and limited by the origin.

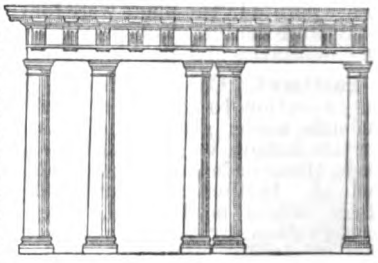
**Intercepting Well.** Large well constructed to collect ground water for the supply of a town. At Brooklyn, N. Y., a well was built 1869, but the lowering of the ground water due to pumping has necessitated the construction of others. The water of such wells is usually of excellent quality, it being naturally filtered like the water of springs.

**Intercession.** Function of Christ as High Priest and Advocate of His people (Rom. viii. 34). A similar office is ascribed to glorified saints by the R. C. and Greek Churches.

**Interchangeable Gears.** Toothed or cog-wheels with the profiles of the teeth so drawn that any wheel of a given pitch will work correctly with any other wheel of the same pitch. This is secured in epicycloidal gears by agreeing to use the same describing circle for all wheels of a pitch, the usual standard being, for each pitch, the circle whose diameter is one-half the pitch diameter of the wheel of twelve teeth in that pitch. This gives radial flanks for that limiting wheel, but all others will be wider at the root, where strength is most needed. See GEAR WHEELS.

**Interclavicle.** Splint bone on the sternum between the clavicles in some Reptiles.

**Intercolumniation.** Distance between two columns measured at the lower part of their shafts. It is one of the most important elements in Architecture, and on it depends the effect of the columns themselves, their pleasing proportion, and the harmony of an edifice. The distance apart depends principally on the order employed, the Tuscan allowing a greater distance than the Corinthian.


Intercolumniation.

**Intercourse** (RIGHT OF) **between States.** Political and commercial intercourse between nations do not proceed from a natural right of one nation as against another, but such relations of intercourse once established, generally through motives of interest, soon develop acquired rights whose violation might lead to serious results.

**Interdict.** Practical excommunication of a city, district, or country; issued by a Pope, Council, or Bishop, forbidding the rites of the Ch. to be administered or its services held; often used with terrible effect in former ages as a punishment for the offenses of monarchs or nations. France was thus disciplined 998 and 1200, England 1171 and 1209. The latest victim was Venice 1606.

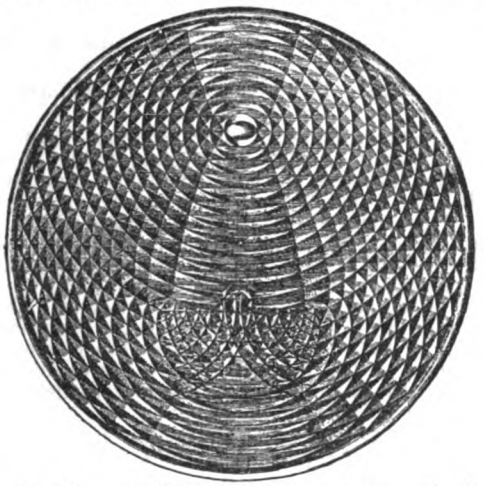
**Interest.** Compensation for the use of money: that part of the return for production which goes to the capitalist. As wages go to the laborer, the employer receives the profits, and the landlord receives rent. If the parties agree upon a certain rate until the principal is paid, this binds them in the absence of legal prohibition of the stipulated rate. After a debt matures, interest is generally allowed by way of damages. If the debtor has contracted to pay interest without fixing the rate, the damages are the statutory rate. If he has not contracted to pay interest, the rule whether he should pay any as damages, and, if so, how much, is a question of fact in each case. In actions for personal injuries, interest is not recoverable unless given by statute. In tort actions, where the damages are certain, as in trespass or conversion, interest at the statutory rate is recoverable; in other tort actions it is in the discretion of the jury. The charge is reckoned at so many hundredths for a unit of time on each unit of value: this is rate per cent. The money used is called the principal. The

interest is a direct function of principal, rate per cent, and time.

**Interest,** COMPOUND. In this the amount at the close of each unit of time becomes the principal for the succeeding unit. The units of time are intervals in a geometrical progression in which the principal is the first term, and unity, plus the rate, the common multiple. $P.(1+r)P.(1+r)^2P. \ldots\ldots (1+r)^nP$ is the form of the series. The $(n+1)^{th}$ term is the amount at the close of n units of time. The compound interest is found by subtracting the principal from the $(n^1+1)^{th}$ term.

**Interest,** SIMPLE. That in which the lapse of time beyond the unit has no effect on the principal. If P.,r.,t., and I. represent respectively principal, rate, time, and interest (rate and time having always the same time unit) $I=t.r.P$ gives the relation between the elements. Amount is the principal increased by the interest for the given time. If A=amount, $A=P+I=P(I+t.r)$ gives the relation.

**Interference.** Simultaneous action of two wave motions at the same point. The result is dependent upon the relative phases of the two interfering waves, as well as upon their wave lengths and amplitudes. Thus, *e.g.*, if two waves of the same period and amplitude meet in opposite phases, they will mutually destroy each other; if they meet in the same phase,



Intersection of direct and reflected water waves in a circular dish. The point of disturbance being midway between center and circumference.

the resultant wave will have a double amplitude. In any case, the amplitude will be the algebraic sum of the amplitudes of the component waves. The phenomenon of interference is observed with water waves, sound waves, and light waves. See FOURIER-MOTIONS and WAVE MOTION.

**Intergenital Plates.** In the echinoid shell, between the genital plates.

**Interim.** Attempts of Charles V., 1541 and 1548, to keep doctrine stationary till a council could settle the differences between Catholics and Protestants.

**Interior Angles.** Those formed within the boundaries of a figure; opposed to exterior angles, which require one side to be produced.

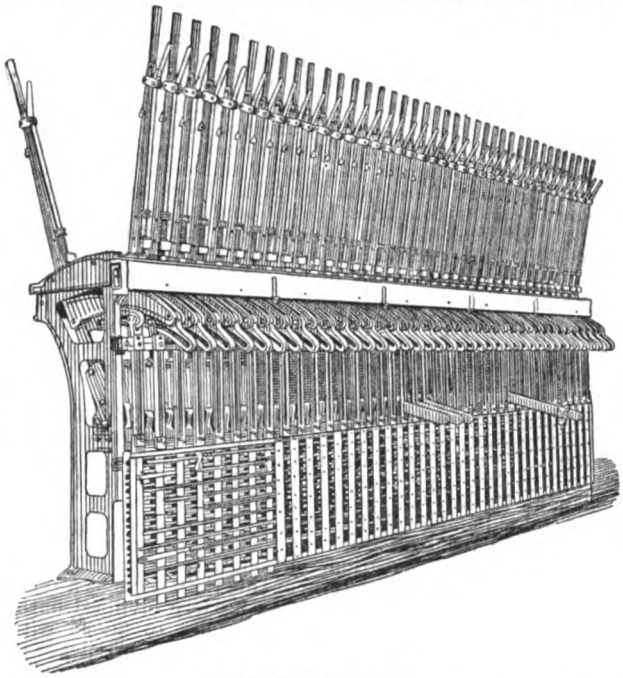
**Interior,** DEPARTMENT OF THE. Formed 1849, with care of public lands, surveys, patents, pensions, education, census, railroads, Indian affairs, etc. Its head is a member of the cabinet.

**Interjections.** Words of exclamation, having no grammatical character.

**Interlaken.** Swiss summer resort, on the Aar, in canton Berne. Pop. 2.100.

**Interlineations.** Words written between the lines or on the margin of a document. Precautions are needed to give them legal character.

**Interlocking** OF RAILWAY SWITCHES AND SIGNALS. System by which a number of switches are operated from a central point: in connection with each switch is a signal for the guidance of the engineers of trains. It is made mechanically impossible for the operator to open a switch on the main line until all signals related to that switch are set to danger. Conversely, the operator cannot move a signal to safety until the switch to which it relates is in its position of safety. A number of mechanical appliances are called for by the concentration of switches and signals operated at a distance and out of sight of the operator. Provision must be made to compensate for expansion and contraction by heat and cold of the rods which transmit motion from the cabin; switches must be thrown completely and locked in position before the safety signal can be shown; provision must be made against moving a switch while a train is passing over it, which would split the train, so as to run on two tracks. These have been satisfac-



Interlocking Switches.

torily solved, and the responsibility of accident is thrown on the engine-driver instead of upon the switch-tender. The latter cannot make a mistake; the engineer may disregard the signals shown to him. The illustration shows the interlocking machine used in the yard of the Grand Central Station, New York.

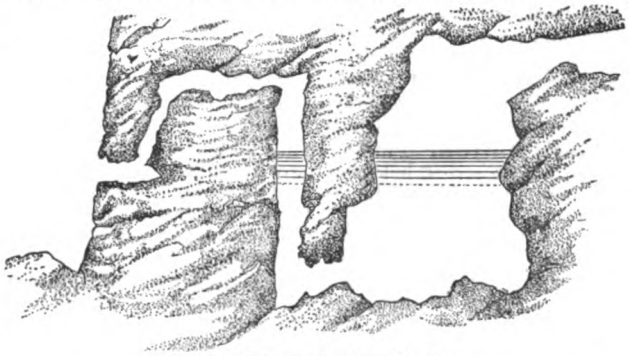
**Intermaxillaries.** See PRÆMAXILLÆ.

**Intermediate Cell Mass.** Embryonic cells that lie ventral to the protovertebral segments, but have not been affected by the cleavage of the mesoblast, in embryos of Vertebrates.

**Intermediate State.** Between death and the general resurrection; whether of consciousness or of suspended animation is a matter of varying opinion, on which Scripture sheds no definite light. The R. C. Ch. fills the gap with purgatory.

**Intermittent Fever.** Most common form of malarial fever, and the one in which a chill is succeeded by fever, the entire attack lasting usually but a few hours. Attacks recur every 24, 36, 48, 72, etc., hours, usually at about the same hour, but during the intervals a person enjoys his customary health.

**Intermittent Spring.** One flowing for a time, ceasing, and after an interval beginning again, and so on. More properly applied to one having a regular period of flow or nearly so, the water being drawn from a reservoir in the interior of a hill by



Section of an Intermittent Spring.

a siphon which discharges a larger quantity than what flows in, so that after being emptied to the inner aperture of the siphon it ceases to discharge until the reservoir is filled up to the bend of the siphon, when it will again begin to flow.

**Internal Acts.** Volitions in which the foreseen consequences are conceived as solely effects on the agent's own feelings and character.

**Internal Gear.** See GEAR WHEELS.

**Internal Goods.** Possessions which one is gifted with by nature, or has educated in himself by his own efforts, as muscular strength and mental attainments.

**Internal Revenue.** Government income drawn from any source except duties on exports or imports. In the U. S. it has come to mean the revenue arising from the taxation of various articles of domestic production, especially spirituous and malt liquors, tobacco, and a few other objects.

**International,** THE. Society of workingmen formed 1864 at London. It was under the influence of the socialist Karl Marx, its president; it rapidly organized branches in almost every country of Europe, and roused universal apprehension. Annual meetings were held till 1874. Laws against it were adopted in various countries; the national animus of the Franco-German war weakened its principles; it suffered from a split between the more radical and more conservative elements, and during 1870–80 it lost most of its membership and strength.

**International Bimetallism.** Adoption of the free coinage of both gold and silver according to an agreement of some kind among several nations, as to the ratio between the two metals, amount to be coined, and perhaps in other particulars.

**International Congress.** See CONGRESS OF GEOLOGISTS.

**International Law.** 1. Public. Body of rules generally observed by civilized states in their intercourse and relations with each other. A de facto, independent state has the right to manage its internal affairs without interference by other states; to hold and guard its territory and property against all others; to cut itself off from intercourse with other nations, and to prohibit immigration, although the social nature of man makes against the exercise of this right save as a temporary and exceptional expedient. As modern civilized nations cultivate friendly intercourse, they secure to aliens within their borders most of the rights and business privileges possessed by citizens, and permit them to become naturalized and thereafter to enjoy all political privileges. They also secure various diplomatic agents of foreign countries against interference or disturbance. War between two countries breaks off friendly intercourse between them and their respective subjects; but it does not subject non-combatants to unnecessary injury, and the citizens of the hostile state are often permitted to remain in the territory of the other combatant. The usages of war, both on land and sea, are growing more humane. Neutral trade has been more accurately defined and is better protected than formerly Paper blockades are giving way to actual ones, and the rights of visitation and search are not as grossly abused as formerly. 2. Private. The body of rules generally observed by the courts of civilized states in determining litigated questions between the citizens of different countries, or which have arisen in a foreign state, or depend for their determination upon the jurisprudence of two or more states.

**International Trade.** Double operation of importation and exportation of commodities into or from different countries. As to the economic laws under which it takes place, and the desirability of encouraging, discouraging, or otherwise modifying it by action of the government, political economists have held directly opposite views.

**Internode.** Space between two consecutive nodes of a stem.

**Interoperculum.** Membrane bone which forms the posterior part of the operculum in fishes, and lies between the opercular and subopercular bones.

**Interpleader.** Proceeding by which a party brings two or more claimants to property in his hands before the court for the determination of their adverse claims.

**Interpolation.** Finding in any series terms formed under the law of the series, between two given terms. It is, essentially, a change of the time interval at which the results of the law are noted. The expression for the general term of a series will effect interpolation by giving fractional values to the symbol designating the number of the term.

**Interpretation.** Ascertaining the intention of the author of a writing from the instrument. Various rules will be found in Lieber's *Hermeneutics*, Sedgwick's *Statute Law*, but they have been summarized by Kent (vol. ii., p. 553) as "the conclusions of good sense and sound logic applied to" the writing in question.

**Interradius.** See RADIAL SYMMETRY.

**Interregnum,** THE GREAT. In Germany, between the death of Conrad IV., 1254, and election of Rudolf I., 1273; marked by increasing power of the princes, and growth of cities.

**Interrex.** At Rome, when the supreme magistracy fell vacant, either from the death of the king, or, in later days, when those in office had died or the people had failed to elect the annual magistrates, the Senate named certain members who exercised the government in turn for terms of five days each, until the permanent officers were chosen.

**Interrupter.** Device attached to an induction coil or other electrical apparatus, by means of which the circuit is rapidly and automatically made and broken. See INDUCTORIUM.

**Intersection.** Cutting of one geometric object by another. The intersection of two loci requires that their equations be simultaneous: values of the variables which satisfy both equations are co-ordinates of points of intersection. The condition that three straight lines shall intersect in one point is that the determinant formed from their parameters shall vanish.

**Intersection,** ANGLE OF. Of two straight lines; obtained through its tangent from the formula $\text{Tan}\ \phi = \frac{m - m_1}{1 + mm_1}$ where m and $m_1$ are the slopes of the given lines.

**Intersection,** PLANAR. Intersections of lines with planes and planar intersections are determined through simultaneous equations by the use of determinants.

**Interseptal Dissepiments.** Vertical partitions between the septa of corals.

**Interseptal Spaces.** See MESENTERIES OF CŒLENTERATES.

**Interstapedial.** Posterior piece of the columella auris in the Frog.

**Interstate Commerce.** However much one of our State governments might legislate concerning public carriers, its authority could not pass the boundary lines. Railroads doing business in more than one State were largely a law unto themselves, until February 4, 1887, when Congress passed an "Act to regulate commerce." This act was for the purpose of doing away with all secret rates and discriminations between persons and places, and to regulate more equitably charges on long- and short-haul business. Five Interstate Commerce Commissioners are required to see that the provisions of the act are carried out. Up to the present much good has been done, enormous as the interests involved are, but it is only gradually that the commissioners have accomplished and can accomplish the purpose intended.

**Intertarsal Joint.** One that falls between the two rows of bones of the tarsus, as in the leg of birds.

**Intervals.** In Music, relation which one tone bears toward another in respect of pitch, *i.e.*, acuteness or gravity. They are designated by numerical terms, counting from the fundamental tone of a diatonic scale, and are broadly divided into consonant and dissonant. Unisons, octaves, fifths, fourths, thirds, both major and minor, and sixths, both major and minor, are consonant intervals; seconds and sevenths are dissonant. The names are further qualified by chromatic change in either of the tones of the interval.

**Intestines.** Canal or tube extending between the stomach and the rectum, consisting of the Small Intestine, subdivided into the Duodenum, Jejunum and Ileum, and about twenty feet in length, and the Large Intestine, divided into the Cæcum, Colon and Rectum, and about five feet in length. They consist of circular and longitudinal muscular fibers, which force the food and fæces toward the rectum, connective tissue, vessels and nerves, and a lining of mucous membrane freely provided with glands which secrete digestive fluids and absorb the food. See ABDOMEN.

**Intextine.** Third coat in the cell-wall of the pollen grains of certain plants, as the Evening Primrose, intermediate between the extine and intine.

**Intine.** Inner layer or coat of the cell-wall of a pollen-grain.

**Intonation.** 1. Opening phrase of a chant melody when sung solo by the officiating priest or a smaller body than the full choir, at the beginning of a portion of the Ch. service. 2. Performance considered, in regard to its justness of pitch, absolute or relative.

**Intoxication.** Not a defense to a contract, unless brought about or taken advantage of by the other contractor; not a defense to a criminal action, save in rare cases. See ALCOHOLISM.

**Intracarpellary.** Growths or organs within a carpel.

**Intracellular Digestion.** Inside the protoplasmic substance of the cells of tissues, in which case each cell feeds like an amœba; occurring in a certain sense in all cells, but more especially in the flagellated cells lining the canals in sponges, in which no true digestive tract is present.

**Intrados.** Inner curve of the ring of a stone arch.

**Intra-Mercurial Planets.** Planets supposed to have been seen from time to time within the orbit of Mercury. All such observations are now believed to be entirely untrustworthy.

**Intransigentes.** Radical party in the Spanish Cortes, or (later) in the nation. The word came into use when Amadeus abdicated 1873.

**Intrapetiolar.** Organs borne within or beneath a petiole, or between the petiole and stem.

**Intraseptal Spaces.** See MESENTERIES OF CŒLENTERATES.

**Intravaginal.** Branches of grass culms which develop between the sheath of a leaf and the stem.

**Intrenchment.** Any field work consisting of at least a ditch, from which the earth is taken, and a parapet; also, any artificial device, however slight, by means of which troops can

In the Trenches.

be aided in holding a position, as intrenched camps or lines with intervals. In modern warfare, troops are instructed in the art of intrenching and in taking advantage of every cover, however slight.

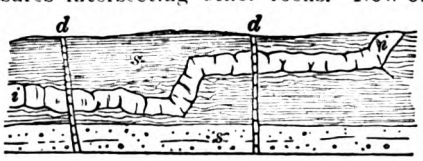
**Intrinsic Luminosity.** The inherent brightness of a luminous source may be measured by the quantity of light emitted per unit area in any given direction. Thus this property does not diminish as the distance increases.

**Introit.** Anthem sung at beginning of mass or of the antecommunion service, by practice of ancient date.

**Introrse.** Anthers of a flower when they face inward, or toward the pistil, as in Violets; also known as Anticous.

**Introspection.** Attending to one's own states of consciousness; method of psychological inquiry of which the value is much disputed. See PSYCHOLOGY.

**Intrusive.** Rocks that have been ejected from below through fissures intersecting other rocks. Now often styled




Intrusive Sheet and Dykes.
*i*, igneous intrusive sheet; *d*, *d*, dykes; *s*, *s*, sedimentary strata.

Plutonic or such as are revealed at the surface by erosion of overlying rock.

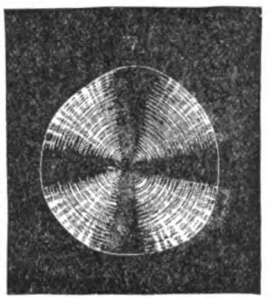
**Intubation.** Introduction of a tube into a canal or cavity, especially into the larynx in croup or diphtheria, when it is obstructed by a membrane, to permit the passage of air to and from the lungs.

**Intuition.** Direct or immediate cognition or apprehension of an object or truth, as opposed to that derived from sense perception and experience; sometimes, the necessary assumptions made in the interpretation of all experience, and not derived by it.

**Intuitionism.** That view of morality according to which conduct is held to be right when conformed to certain precepts or principles of duty intuitively known to be unconditionally binding.

**Intussusception.** Process of increase in the size of vegetable cell walls by the intercalation of particles of cellulose among those already formed. — Inversion of the intestines within an adjoining portion.

**Inulin.** Substance closely related to starch, occurring in solution in the sap of many plants of the natural family *Compositæ*. It is precipitated by alcohol, and separates from the fluid in small globose masses with a distinctly radiating structure.



Inulin of *Helianthus tuberosus*.

**Inundations.** See FLOODS and JOHNSTOWN.

**Invagination.** Folding in, as when one side of a hollow rubber ball is pushed in against the other; typical manner in which a blastula becomes a gastrula in the development of animals.

**Invalides,** HOTEL DES. See HOTEL DES INVALIDES.

**Invariable Plane.** Laplace's investigations showed that a plane existed in the solar system whose position could never change through the mutual action of the planets. It is so situated that the sum of the products obtained by multiplying each planet's mass by the projection of the area described by the radius vector in a unit of time shall be a maximum.

**Invariant.** In Higher Algebra, such a function of the coefficients of an equation or system of equations that the same function of the coefficients of these equations, transformed by linear substitution, will equal the original function multiplied by some power of the modulus of transformation. If the modulus factor be of the zero power, the invariant is absolute. In Higher Geometry, an invariant expresses some property of a locus independent of the choice of axes.

**Invention.** Contrivance of something not previously existing, as a new machine or a new process. Discovery is finding out something already existing, but not known, as the law of gravitation or the circulation of the blood.

**Inventory.** Schedule of goods and property, together with their values, especially the personal property of a deceased person.

**Inveraray.** Town in Argyllshire, Scotland, on w. coast of Loch Fyne. I. Castle is noted in Scottish history as the seat of the Argyll family. Pop. ab. 1,000.

**Inverlochy.** In Inverness-shire, Scotland; scene of defeat of the Campbells by Montrose, Feb. 2, 1645.

**Inverness.** Seaport of n. Scotland, at e. end of Caledonian Canal; taken by the English 1296, retaken by Bruce 1313;

Inverness.

burned by the Lord of the Isles 1411; taken by Cromwell 1649, and by Prince Charles Edward 1746. Nearby stood the castle in which Macbeth murdered Duncan. Scene of a great flood in 1849. Pop., 1891, 19,214.

**Inverse Functions.** Those in which the base from which the function arises is expressed in terms of the function: same as anti-functions, but with wider application to ordinary algebraic forms. An algebraic function may have more than one inverse.

**Invertebrates.** See ANIMAL KINGDOM.

**Inverted.** In Heraldry, applied to the figures on the shield when turned in a direction other than what is usual.

Inverted.

**Inverted Arch.** Arch laid with its concave side downward; used for the lower part of conduits and sewers, and also in foundations.

**Inverted Sugar.** Mixture of dextrose and lævulose produced by the action of dilute acids upon ordinary cane sugar. This change also takes place occasionally when cane sugar is stored in quantity in damp places. It turns the plane of polarized light to the left and crystallizes with difficulty.

**Investiture.** Orig., conferring a fief on a vassal; thence applied, under the feudal system, to bishops and abbots, as exercising minor secular rule. The Emperors claimed this right, which caused continual quarrels with the Popes. Gregory VII. in 1075 denounced the practice as simony, and waged a fierce contest with Henry IV. The matter was compromised at the Diet of Worms, 1122.

**Investment.** Capital put in a position in which it is expected to bring a return to the investor, either simply as interest, or, more properly, as a sum including interest, insurance on risk, and perhaps a proportion of profits or earnings of management.

**Invitatorium.** Antiphon of Psalm CXV., Venite exultemus Domino, the invitatory Psalm. In the Gregorian and Benedictine offices it is sung several times during the Psalm as well as at the beginning and the end.

**Invocation of Saints.** R.C. and Greek practice, based on the doctrine that, though the glorified saints are not sources, their intercession may lawfully be invoked as a channel of grace. There is a similar invocation of angels.

**Involucel.** Secondary involucre in a compound flower-cluster, as in many *Umbelliferæ*.

**Involucre.** Circle of bracts subtending a flower or flower-cluster, as in the Dogwood and many *Umbelliferæ*.

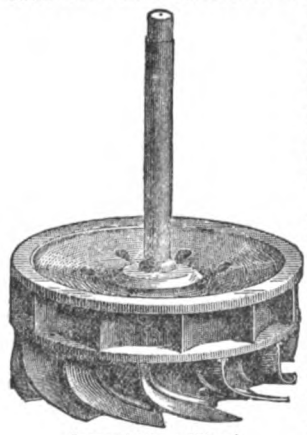
**Involute.** Method of vernation, where the leaf is rolled up from both margins on the upper surface, as in the Water Lily; also method of æstivation, where each petal or sepal overlaps the preceding one, as in the Gentian.

**Involute.** The primary curve from which an evolute is derived; defined independently as formed by a fixed point on a cord as it is unwound from a given curve.

**Involute Teeth.** Form of profile for the teeth of gear wheels, derived by a tracing-point at the end of a line which rolls upon the circumference of a base circle. This base circle has a radius which equals the radius of the pitch circle multiplied by the sine of the complement of the permitted obliquity of action of the teeth. This latter is usually 15°. Involute teeth have a constant obliquity, allow of separation of the axes of the two wheels of a pair, and are useful for differential gears. They exert a side pressure on the shafts of the wheels. See GEAR WHEELS.

**Involution.** Opposite of evolution; process of acquiring the characters that are unfolded during evolution or development.

**Involution.** In Arithmetic and Elementary Algebra, process of raising any quantity to a given power.—In Modern Geometry, when three or more pairs of rays in a pencil are each harmonic to the same pair, these lines are said to be in involution. The common harmonic is called Focal Rays. If a transversal be cut by lines in involution, the points of section will be in involution. The sections of the focal rays with the transversal are foci, and the mid-point of the foci is the center of involution.



Inward Flow Wheel.

**Inward Flow Wheel.** Turbine wheel in which the water enters around the circumference and flows out near the axis. Most American turbines are built on this plan, the water having a downward as well as an inward movement. Inward flow wheels are somewhat more regular in speed than outward. The figure shows such a wheel without its inclosing case.

**Io.** Daughter of Inachus, King of Argos; loved by Zeus, and changed by him into a heifer for fear of Hera, who plagued her with a gadfly and drove her from land to land; personification of the moon; represented as a woman with horns of a heifer.

**Iodal.** $CI_3.C.OH$. Iodine compound corresponding to CHLORAL (q.v.).

**Iodic Acid.** $HIO_3$. Crystallized solid, decomposing at 170° C., forming water and iodine pentoxide; made by passing chlorine into water containing iodine in suspension.

**Iodides.** Metallic derivatives of hydriodic acid, or compounds formed by the union of iodine with some other element.

**Iodine.** I. At. wt. 126.85, sp. gr. 4.95, sp. ht. .054, mpt. 114° C., valence I. III. V. VII. Discovered by Courtois 1811; grayish-black, metallic-looking solid, having a peculiar taste and odor suggesting chlorine; obtained from the ashes of certain seaweeds, and from Chili saltpeter. In the laboratory it is made by treating a mixture of sodium iodide and manganese dioxide with sulphuric acid. It is soluble in alcohol, ether, and carbon bisulphide. Used in medicine, photography, and the manufacture of certain dyes.

**Iodine Green.** $C_{27}H_{35}N_3Cl_4Zn$. Green coloring matter, prepared by the action of methyl iodide or chloride on rosaniline. The commercial color is a green amorphous substance containing the color in combination with zinc chloride.

**Iodine Monochloride.** ICl. Thick reddish-brown liquid, made by passing chlorine over iodine.

**Iodine Pentoxide.** $I_2O_5$. White powder, soluble in water, forming iodic acid; made by heating iodic acid, $HIO_3$, to 170° C.

**Iodine Trichloride.** $ICl_3$. Yellow crystallized compound, made by passing chlorine over iodine monochloride.

**Iodo Compounds.** Organic compounds derived by the replacing of hydrogen by iodine. The iodides are compounds whose name signifies a combination of a group with iodine; thus $CH_3.I$ is iodomethane or methyl iodide. See BROM COMPOUNDS.

**Iodoform.** $CHI_3$. Yellowish solid, melting at 119° C.; prepared by warming alcohol with iodine and caustic potash. It has a marked odor, and is much esteemed as an antiseptic, and used extensively in surgery.

**Iodol.** $C_4I_4.NH$. Tetraiodopyrrol; compound produced by the action of iodine and caustic potash upon pyrrol; yellowish-brown plates with iodine odor; used as an antiseptic.

**Iolaus.** Companion and driver of Hercules; victor at the first Olympian games.

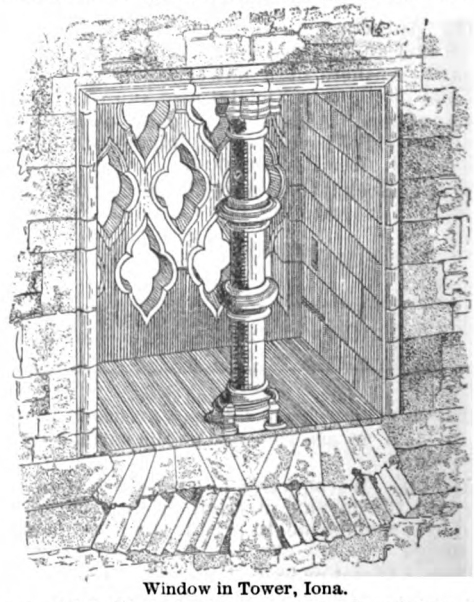
**Iolcus.** Port of Thessaly, from which the Argonauts were said to have sailed.

**Iolite.** $H_2(Mg,Fe)_4Al_8Si_{10}O_{37}$. Bluish mineral, essentially a hydrous magnesium, iron, aluminium silicate. It suffers decomposition easily, and hence is not common in an unaltered state. It is known also as Cordierite and Dichroite.

**Ion.** See ELECTRODE.

**Ion,** 484–421 B.C. Greek tragic and lyric poet.

**Iona,** or ICOLMKILL. One of the Hebrides, once a seat of Druids; colonized 563 by COLUMBA, ST. (q.v.), who built a monastery from which Christianity was introduced into Scotland; ravaged by the Norsemen. The ruins now to be seen are of later date.



Window in Tower, Iona.

**Ionia.** District on w. coast of Asia Minor, anciently colonized by Ionian Greeks. The Ionian Confederacy, embracing 12 cities, all near the coast, had a common sanctuary and a national assembly. They were conquered by Crœsus, by Cyrus 545, and again by Persians 496. Many poets, artists, and philosophers arose here.

**Ionian Colonies.** See COLONIES, GRECIAN.

**Ionian Islands.** In the Mediterranean, off the w. and s. coasts of Greece. The principal of them are Corfu, Cephalonia,

Canal and Town of Santa Maura, one of the Ionian Islands.

and Zante. Their entire area is 1,041 sq. m. They were held by Venice from 15th century to 1797, by Great Britain from 1809–15 to 1863, and then given to Greece. Pop. ab. 250,000.

**Ionians.** People claiming descent from Ion, son of Apollo, and Creusa, daughter of an Athenian king, who, driven out of Peloponnesus, settled in Attica and ab. 1050 B.C. sent colonists to the Asia Minor coast. There they founded many cities, including Ephesus, Smyrna, Clazomenæ, and Miletus, which, as the Ionian League, became subject successively to Persia, Athens, Sparta, and Persia again. From the time of Alexander the Great they experienced the same fate as the surrounding peoples.

**Ionic Order.** See ARCHITECTURE.

**Iota.** Ninth letter of the Greek alphabet; used in its small form, "$\iota$," to represent an infinitesimal. With an exponent preceded by the minus sign ($\iota^{-1}$) it represents an infinite.

**Iowa.** One of the n. central States. Its area is 56,025 sq. m. Its surface is throughout an undulating prairie. Bluffs of considerable height exist on the Mississippi and Missouri rivers, which form the e. and w. boundaries, and on many of the smaller streams. In the n.e. part along the Mississippi, Silurian formations are developed to a considerable extent. Proceeding s.w. one crosses an area of Devonian, and then enters an era of Carboniferous, which covers the s. half of the State. The n.w. corner is occupied by Loess, and this is found scattered over small areas in various other portions. I. is pre-eminently an agricultural State, its other industries being subordinate. The coal mining industry is of considerable importance. In 1893 its railroads had an extent of 8,513 miles. The capital is Des Moines. I. was originally included in the Louisiana purchase; in 1834, with all the region w. of the Mississippi and n. of the Missouri, it was included in the territory of Michigan. In 1836 it was set off with Wisconsin, and in 1838 was made a territory by itself. It was admitted to the Union as a State in 1846. It was originally occupied by several Indian tribes, the first white settlers entering the territory in 1833. The recent growth of the State has been rapid and its condition prosperous. Value of farms in 1890 was $894,246,337 and of crops in 1889 was $159,347,844. In 1889, 4,061,704 tons of coals were mined. Pop., 1890, 1,911,896. (See Map, p. 388.)

**Iowa,** STATE UNIVERSITY OF. At Iowa City; opened 1855, reorganized 1860. Its law department was created 1868, medical 1870, homeopathic medical 1877, dental 1882, pharmaceutical 1886. It had, in 1895, 93 instructors, 489 students in the college: in law 214, in medicine 262, in dentistry 163; in all departments 1,133. A portion of its funds is derived from the U. S. Land Grant of 1861. The library contains 37,000 vols.

**Iowa Agricultural College.** Founded 1859 near Ames; endowed by land-grants 1862. It had 33 instructors and over 500 students in 1892.

**Iowa College.** Founded 1848 by Congregationalists at Davenport; removed to Grinnell 1859. Besides the college proper, it comprises an academy, and schools of art and music. It had, in 1895, 32 instructors, 220 students in the college, 22 graduates, 157 in the academy, and a total attendance of 487. Endowment, $250,000. Women were admitted 1859.

**Ipecac.** *Cephælis ipecacuanha.* Small, shrubby plant of the natural family *Rubiaceæ*, native of S. America; collected for its root-bark, which furnishes the well-known emetic. The alkaloid Emetin is the active principle. Some other plants of the same family have been used as substitutes.

**Ipecac,** AMERICAN. *Porteranthus stipulaceus.* Perennial herb of the Rose family, native of the s. U. S.

**Ipecac,** WILD. *Euphorbia ipecacuanha.* Low herb of the Spurge family, native of N. America.

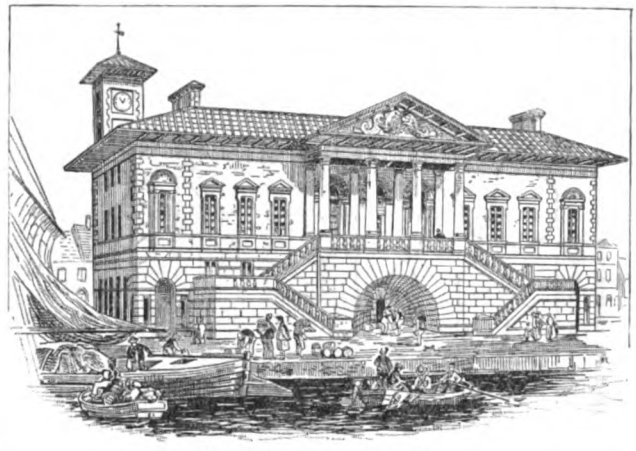
**Iphicrates,** ab.417–353 B.C. Athenian general, who introduced peltasts or targeteers, and with them routed the Spartans near Corinth 392. He married a daughter of the King of Thrace, and held command in the Social War.

**Iphigenia.** Daughter of Agamemnon and Clytæmnestra; sacrificed by her father to appease Artemis, who detained the Grecian fleet at Aulis by a calm; rescued by the goddess substituting a hart and carrying her to Tauris, where she became a priestess; celebrated by Euripides.

**Ipsamboul.** See ABU SIMBEL.

**Ipsus.** Ancient town in Phrygia, scene of the decisive defeat of Antigonus by Selencus and Lysimachus, 301 B.C.

**Ipswich.** Borough of Suffolk, England, on the Gipping.



Hall of Commerce, Ipswich.

Its leading manufactures are agricultural implements, fertilizers, railroad plant, and clothing. Pop., 1891, 57,260.

**Iquique.** Seaport of Chili, noted for exportation of sodium nitrate; held by Peru till 1880. Near it the Chilian ship *Esmeralda* was sunk by the *Huascar*, May 21, 1879. Pop. ab. 20,000.

**Iran.** PERSIA (q.v.); anciently the whole upland country from Kurdistan to Afghanistan.

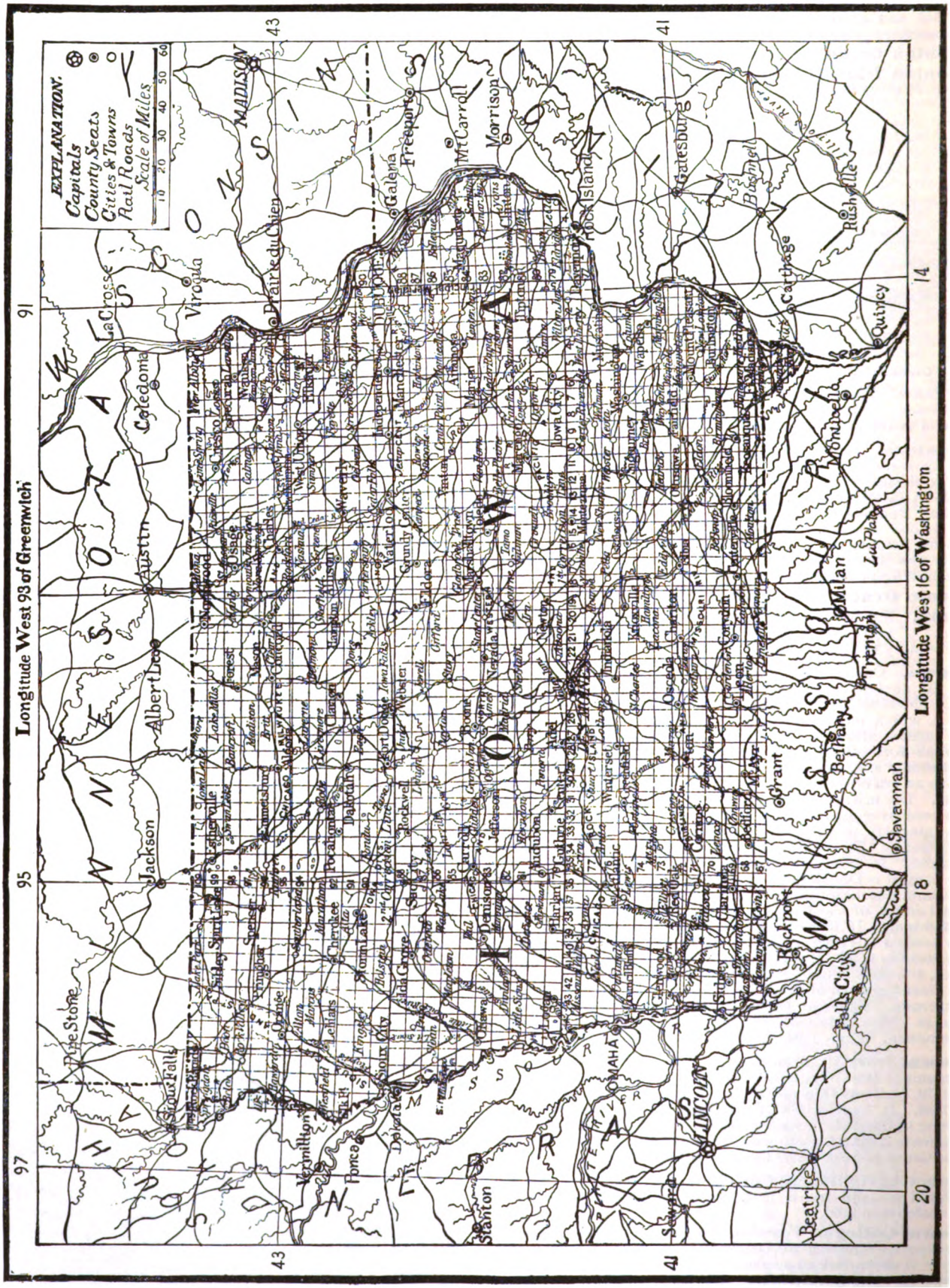
**Iranian Languages.** Group closely allied to the Hindu, and represented in the oldest times by the Avestan or so-called Zend, and more recently by the Middle and New Persian, and by modern dialects such as the Afghan and Kurdish.

**Irascibility.** Proneness to anger with any person whose actions interfere with our pleasures and desires.

**Irawaddy.** River of s. Asia. Rises in the s. border of Thibet and flows s. across Burmah into the Bay of Bengal,

The Irawaddy below Prome.

which it enters through a large delta. Length 1,060 m., drainage area 150,800 sq. m.


EXPLANATION.
Capitals
County Seats
Cities & Towns
Rail Roads
Scale of Miles
10 20 30 40 50 60
Longitude West 93 of Greenwich
Longitude West 16 of Washington
97
95
91
43
41
18
14
20
MINNESOTA
WISCONSIN
ILLINOIS
MISSOURI
NEBRASKA
SOUTH DAKOTA
MISSISSIPPI RIVER
Pipe Stone
Sioux Falls
Jackson
Albert Lea
Austin
Coledonia
La Crosse
Viroqua
Dairie du Chien
MADISON
Galena
Freeport
Mt Carroll
Morrison
Rock Island
Galesburg
Bushnell
Rushville
Carthage
Quincy
Monmouth
Milan
Trenton
Bethany
Grant
Savannah
Rockport
Falls City
Beatrice
Seward
LINCOLN
OMAHA
Stanton
Fonca
Vermillion
Sioux City
Sioux Lake
Spencer
Storm Lake
Cherokee
Denison
Carroll
Rockwell
Dallas
Des Moines
Iowa City
Mt Pleasant
Burlington
Keokuk
Fairfield
Oskaloosa
Knoxville
Chariton
Corydon
Centerville
Bloomfield
Lamoni
Mapleton
Onawa
Sioux City
Cresco
Decorah
Waukon
Dubuque
Independence
Waterloo
Grundy Center
Marshalltown
Iowa City
Davenport
Muscatine
Keokuk
Fairfield
Ottumwa

**Ireland.** Island in the Atlantic, w. of Great Britain, forming part of Europe, and of the united kingdom of Great Britain and Ireland. The interior is level and undulating, surrounded by hills or low mountains on all sides. The seacoast is broken, affording several excellent harbors. Area 32,583 sq. miles. The industries are mainly agricultural, manufactures having made little progress. Tradition ascribes its conquest to Milesian princes from Galicia in Spain. Christianity was introduced by St. Patrick ab. 450. I. was famous in the 6th century for its schools and as a source of missionary enterprise. It was invaded by Northmen 795. Five kingdoms arose, Ulster, Leinster, Meath, Connaught, Munster; the King of Meath held the overlordship. Henry II. of England, authorized by Pope Adrian IV. to subjugate I., sent Norman adventurers to seize it, who became identified with the natives. The government was intrusted to viceroys, an Anglo-Irish parliament was formed, and the English authority limited. The Fitzgeralds rebelled 1534. Protestantism was introduced 1547. Great troubles followed the Plantation of Ulster 1609–12; *i.e.*, the settlement of English and Scotch Protestants upon the land of dispossessed Catholics. Oppression and misgovernment led to rebellion 1798–1800. Legislative union with Great Britain took effect Jan. 1, 1801. Later events were Emmet's Insurrection 1803; a severe famine 1846; great emigration to America 1860–68. The Fenian brotherhood was organized 1858; the Irish Church disestablished 1869; the Home Rule party founded 1873. A Home Rule bill was defeated 1886. It passed the House of Commons 1893, but was rejected by the Lords. Pop., 1891, 4,704,750, being much reduced since 1850.

**Ireland,** JOHN, D.D., b. 1838. Rector R.C. cathedral of St. Paul, Minn., 1867; Coadjutor Bp. 1875; Abp. 1875; one of the most active and energetic prelates in America.

**Ireland,** WILLIAM HENRY, 1777–1835. English author of *Vortigern* and other plays, 1795–99, which he tried to pass off for Shakespeare's. *Confessions*, 1805.

**Irenæus,** ab. 120–ab. 200. Disciple of Polycarp at Smyrna, Presbyter at Lyons ab. 166, Bp. 177; one of the chief Fathers of his time, though we know very little of his life, and of his writings only a work *Against Heresies* survives. This gives him high rank among ante-Nicene theologians, and belongs to the pictorial and imaginative development of doctrine.

**Irene.** 1. Greek goddess of peace. 2. Ab. 752–803, Empress of Constantinople 769, wife of Leo IV. She acted as regent for her son Constantine VI. 780–790, dethroned and blinded him 797, and was deposed 802.

**Ireton,** HENRY, 1610–1651. English general and regicide, son-in-law of Cromwell; Lord-deputy of Ireland 1650.

**Iridaceæ.** Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Monocotyledons*, comprising ab. 57 genera and 750 species, widely distributed through the temperate and tropical regions of both hemispheres; called the Iris family.

**Iridectomy.** Operation in which a portion of the iris is removed through an incision in the cornea.

**Iridescence.** Phenomenon of interference, which presents many brilliant colored effects. It is manifested when light is allowed to fall upon transparent substances composed of very thin plates or crossed by fine lines, as the scales of a fish or mother of pearl. See DIFFRACTION and INTERFERENCE.

**Iridium.** Ir. At.wt. 193.1, sp.gr. 22.42, sp.ht. .0323, mpt. 1,950°. Discovered by Tennant 1803; rare metal occurring in platinum ores in the Ural Mts. and in Brazil; of grayish-white color, insoluble in acids and dissolved only in a very finely divided condition by aqua regia. It forms three classes of compounds, showing a valency of two, three, and four. See PLATINUM, METALLURGY OF.

**Iridium Bromides.** Similar to the CHLORIDES (q.v.).

**Iridium Chlorides.** Three are known of the formulas $IrCl_2$, $IrCl_3$, and $IrCl_4$. The latter is made by dissolving the metal in aqua regia, the dichloride by heating the tetrachloride, the trichloride by heating the metal in chlorine.

**Iridium Oxides.** IrO?. Monoxide. Heavy black powder, obtained by boiling iridium chloride with caustic potash.—$Ir_2O_3$. Sesquioxide. Delicate blue-black powder, obtained by heating potassium iridium chloride with sodium carbonate. —$IrO_2$. Dioxide. Fine needles with metallic luster, made by heating potassium iridium oxide with bromine and potassium chloride in a platinum vessel.

**Iridium Sesquihydroxide.** $Ir_2(OH)_6$. Greenish-yellow precipitate, obtained by treating sodium iridium chloride with caustic potash and alcohol.

**Iridium Sulphides.** IrS. Monosulphide. Dark yellow or bluish-black mass, made by heating the metal in sulphur vapor, or by passing hydrogen sulphide into a solution of an iridous salt.—$Ir_2S_3$. Sesquisulphide. Brownish-black substance, made by passing hydrogen sulphide into a solution of an iridic salt.—$IrS_2$. Disulphide. Dark brown powder, made by precipitating a solution of potassium iridium chloride with hydrogen sulphide.

**Iridosmine.** Mineral containing iridium and osmium in varying proportions; found with gold and platinum in S. America, the Ural Mts., and in the river and beach sands of Cal. and Oregon. It is nearly as hard as quartz, and is as heavy as gold. It is the chief source of supply of iridium, and is used in its natural state as tips for gold pens.

**Iris.** Personification of the rainbow; in the *Iliad*, the messenger of the gods; in later mythology, wife of Zephyrus and mother of Eros. I. is represented, in works of art, with wings attached to her shoulders, carrying the herald's staff in her left hand and sometimes also holding a pitcher.

Iris.

**Iris.** Genus of showy-flowered plants of the natural family *Iridaceæ*, of wide geographical distribution.

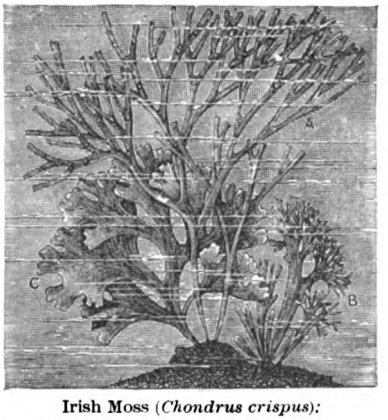
**Iris.** The colored visible portion of the eye, having a central opening (pupil), which varies in diameter to regulate the amount of light entering the eye. It consists of circular muscular fibers around the opening from which others radiate to the periphery, connective tissue, vessels and nerves. It varies from jet black to an almost colorless hue in albinos.

**Iriscope.** Apparatus contrived by Read for producing colored rings, similar to Newton's rings, by interference of light. If a little soap be rubbed on a piece of black glass, and the breath be blown upon a small area of this through a tube, a transparent film will be deposited, decreasing in thickness from the center outward. Rays of light reflected from the two surfaces of this film issue in different phases, and so are in a condition to interfere. The interference of the different colored rays depending upon the thickness of the film, the bright rings will be colored, the less refrangible rays being within and the more refrangible on the outside.

**Irish Elk.** *Megaceros hibernicus.* Extinct form, found in the peat bogs of Ireland. Remarkable for its size and dimensions of its antlers, sometimes 10 ft. spread.

**Irish Language.** Gaelic language of Ireland, a branch of the once widespread Celtic, but now in process of decay. The oldest forms preserved are glosses which date back a thousand years and more.

**Irish Moss.** *Chondrus crispus.* Red sea-weed, common on the shores of the n. Atlantic, nearly soluble in hot water, yielding a vegetable jelly known as "sea moss farina"; used as a basis for puddings. The plant is also called Carrageen.



Irish Moss (*Chondrus crispus*):
A, B, C, different forms of growth.

**Irish Music.** References to the culture of the Irish in early writers prove that music stood in high repute at a time long prior to that in which Ireland is popularly thought to have been barbarous. Irish harpers were famous, and music entered into all the occupations of the people. Irish folk-tunes share some of their characteristics with the Scotch, particularly the frequent omission of the 4th and 7th intervals of the scale, producing the so-called pentatonic succession of tones. Other scales have the semitone between the 2d and 3d and 6th and 7th; the 2d and 3d and 5th and 6th, the 3d and 4th and 6th and 7th. Next to the harp, the bagpipes enjoyed popularity in ancient times, the instrument differing from the Scotch in being blown with bellows. Characteristic

Irish dances are the planxty, jig, reel, hornpipe, and country dance.

**Irish Night.** 12–13 Dec. 1688. Terror and dismay in London were caused by a rumor that the Irish soldiery whom James II. had just disbanded were marching on the city to murder the Protestants. From 1 A.M. to daybreak the whole city was in arms.

**Irish Sea.** Between Ireland and Great Britain.

**Iritis.** Inflammation of the iris, giving rise to pain, immobility and adhesions to the cornea or lens, and may be due to gout, rheumatism, gonorrhea, exposure to cold, brilliant light, injury, and many minor causes.

**Irkutsk.** City of Siberia, on the Angara, at the mouth of the Irkut. Pop., 1890, 50,274.

**Irmin.** Ancient Teutonic deity, worshiped at wooden pillars, one of which stood at Westphalia till 772.

**Irnerius,** d. ab. 1127. Prof. Bologna; expounder of Justinian's *Institutes*.

**Iron.** Fe. At.wt. 56, sp.ht. .0113, mpt. 1,800° C., sp.gr. 7.8. It forms two classes of salts; ferrous, in which it is bivalent, and ferric, in which it is trivalent, the latter being the more stable. Pure iron is almost unknown. The purest in the market is piano wire, which contains ab. .3 per cent of impurities. It can be made by heating the oxide in a current of hydrogen. On the large scale it is obtained pure by heating wrought iron in a lime crucible in the oxyhydrogen flame. It is soluble in the ordinary acids, forming in each case the corresponding salts.

**Iron,** METALLURGY OF. Iron forms ab. $\frac{1}{20}$th of the crust of the earth. Magnetic iron ore (lodestone) carries 72.4 per cent; it occurs in vast deposits in primary or Archæan rocks. Red hematite (specular ore) is an oxide without water, with 70 per cent of iron; it occurs in immense beds in the older geological formations, and is the principal ore of iron. Brown hematite, red ocher, yellow ocher, bog iron-ore, brown clay-iron stone, all impure oxides with 5 to 25 per cent of water and 50 to 65 of iron, frequently impure from admixture with clay, sand, etc., are found in the more recent geological formations. Siderite (spathic ore) is a carbonate, containing 48 per cent of iron when pure; frequently impure, with clay or sand (clay-iron stone), or with bituminous matter like soft coal (black-band iron-stone). It occurs in metallic state in meteorites and in microscopic particles in some eruptive rocks.

In commerce, iron is found in three distinct forms: (1) wrought iron and so-called soft steel; (2) steel proper; (3) cast-iron or pig-iron. The differences between these correspond closely with differences in the amount of carbon which they contain, as follows:

1. Wrought iron and soft steel. Soft and tough; the former fibrous. Tensile strength 40,000 to 60,000 lbs. per sq. inch. Malleable hot and cold. Not appreciably hardened by heating red-hot and chilling in water. Melt only at 1,600° C. or above. It is found by chemical analysis that iron with these properties contains less than 0.4 per cent of carbon.

2. Steel proper. Malleable hot, elastic cold, and brittle if hardened by quenching from a red-heat. Tensile strength 50,000 to 95,000 lbs. Fracture white and finely granular. Melts at 1,400° C. to 1,500° C. This contains 0.4 to 1.6 per cent of carbon chemically combined with the iron. See STEEL.

3. Cast-iron (called pig-iron in its unmanufactured state as it comes from the blast furnace). Not forgeable hot or cold. Melts at 1,075° C. to 1,300° C. Fracture granular, and either white or gray. White iron has all its carbon chemically combined, as in steel; gray iron has most of its carbon in free scales, as graphite. The former is the cheaper, is very hard, brittle, and used only for conversion into wrought iron; it usually carries considerable sulphur. The latter is soft, dark gray to black, rather tough, and used for castings; it is usually rich in silicon. White iron softens at a lower temperature, but runs thick; gray iron melts at a higher temperature, but is very fluid. The tensile strength of both these varieties is 20,000 to 30,000 lbs., and they carry a total amount of 2.3 to 5 per cent of carbon.

When pure iron is heated in contact with carbon to a temperature of 1,800° C., it then quickly absorbs the carbon and passes into cast-iron, which melts easily at that heat. This principle is of importance in understanding properly the following processes.

Iron ores are easily reduced by heating them in direct contact with burning fuel. A lump of ore put into a blacksmith's forge is quickly reduced. The particles of pure iron resulting, however, only become pasty at the heat of a forge, and the temperature is also not high enough for the iron to combine with the carbon of the fuel and form cast-iron. There results, therefore, a spongy mass of highly heated particles of pure iron, which can be taken out of the forge and rapidly welded by hammering into a solid lump or bar of soft iron. This is the principle of the ancient methods of obtaining iron as used among all peoples, and even now not extinct in many countries. The Catalan Forge, shown in Fig. 1, is a good type of these forges for the direct production of wrought iron from iron ore; it was in use in the Pyrenees until recent times. A cavity (*c*, *d*) is lined with bricks, and filled with fuel mixed with iron ore. A blast of air is conveyed by the air-pipe T and discharged through the nozzle N. The apparatus on the left is a trompe, or water-blast, in which the falling column of water B draws air through the openings *g*, *g*, and thus furnishes air pressure in the box E. Such an arrangement is suitable in mountainous countries, where waterfalls abound. In such a forge, a charge would be worked in six hours, producing 300 lbs. of iron. When the reduction is complete, the spongy mass is lifted out of the hearth and welded by rapid hammering with tilt-hammers into bar iron. If such a forge were worked extra hot, with plenty of fuel, the iron would absorb a small amount of carbon, and rather hard steely iron sometimes result. In Germany and England a sort of stack or chimney was built over the hearth into which the charges were placed to be heated up before entering the hearth by the hot gases rising from the hearth. With this arrangement, coupled with an increase in the size of the hearth, the temperatures in these hearths reached ab. 1350° C., the point at which iron absorbs sufficient carbon to form cast-iron. The "high ovens" of Germany and "high forges" of England thus developed into the modern blast-furnaces; for when once the usefulness of cast-iron had been tested, the sizes of the furnaces were rapidly increased to meet the demand.

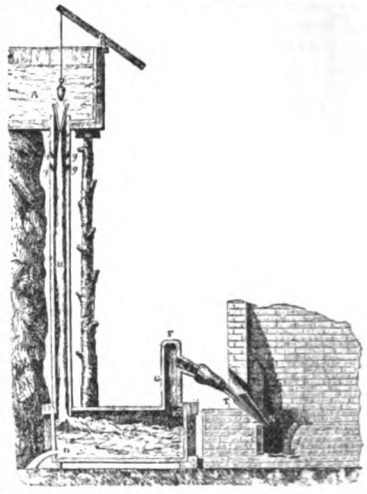


Fig. 1.—Catalan Forge and Trompe: vertical section.

Cast-iron is made only in blast-furnaces, of which Fig. 2 shows a modern example. The furnace is an immense shaft 50 to 100 ft. high and 10 to 20 ft. inside diameter, cased outside with boiler iron and lined inside with fire-brick. The mixture of ore, fuel, and flux is charged in above, at the throat of the furnace (A), while heated air is blown in beneath from the blast-pipe D; the waste gases, leaving by the pipe F, deposit their dust in the box H, and are then burned in stoves to heat the blast. B is the body of the furnace, where reduction takes place: C are the boshes, where the charge is melted, slag formed and iron absorbs carbon and becomes fluid cast-iron. The slag and iron collect in the crucible G. The combustion of the fuel in the lower part of the furnace produces great heat and generates large quantities of carbonic oxide gas, which is a strong reducing agent and abstracts oxygen from the ore as it rises through the furnace. The impurities of the ore (silica, clay, etc.) unite with the flux (limestone) to produce a fluid slag; the reduced iron is hot enough to absorb carbon and melt freely; the slag and iron collect in the bottom of the furnace, the slag on top, and are tapped out at tap holes at different levels. The fuel used is charcoal, coke, or coal, the flux unburned or burned limestone. For producing one ton of pig-iron there is required one ton of charcoal or coke, or $1\frac{1}{4}$ of coal, with $1\frac{1}{4}$ to $2\frac{1}{2}$ tons of ore (according to its richness), and $\frac{1}{8}$ to $\frac{3}{8}$ ton of flux (according to whether burned or unburned and the amount of impurities in the ore); meanwhile about 5 tons of air will be blown in and 6 tons of gases escape. The iron is run from the furnace on to the casting-bed, and there cast in sand into the bars called pig-iron, weighing ab. 100 lbs. each. Most modern furnaces have the blast heated by passing through hot-blast stoves; the gases coming from the furnace are utilized by being burned in these stoves.

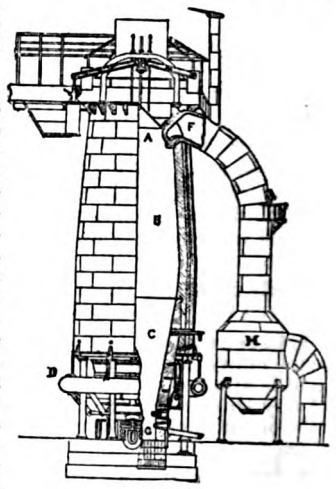



Fig. 2.

Pig-iron is used for three purposes: (1) For making castings; (2) for conversion into wrought iron; (3) for conversion into steel.

For making castings, it is remelted in reverberatory or cupola furnaces (the latter being similar to a diminutive blast furnace). The melted iron is cast in molds, generally of sand, sometimes of iron.

For conversion into wrought iron, it is put through the operation of puddling. A cheap grade of white iron is melted on the hearth of a reverberatory furnace (see Fig. 3), and air allowed

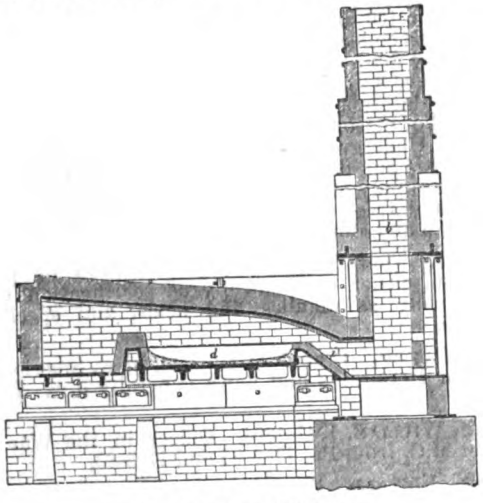


Fig. 3.—Puddling Furnace.

to pass freely over it. Under these circumstances, the carbon, silicon, manganese, sulphur, and phosphorus occurring in the pig-iron are oxidized, and with iron oxide form a slag or cinder, while the purified iron becomes less and less fluid as it gets purer, until it is a pasty mass of grains of pure iron. This spongy mass is then removed from the furnace in several lumps at a welding heat, squeezed, hammered and rolled into a tough, fibrous bar of wrought iron, called muck bar. Several of these bars are piled on top of each other, heated to a welding heat, and rolled down again to commercial sizes of rods and bars, called merchant iron. Such iron is very tough, fibrous, and silky on its fracture, and has a tensile strength of 40,000 to 60,000 lbs. per sq. inch, with 20 to 40 per cent elongation.

*Pig Iron Production of the World in Tons.*

| | |
|---|---|
| Austria-Hungary | 981,409 |
| Pelgium | 810,940 |
| Canada | 50.166 |
| France | 2,077,647 |
| Germany | 5,380.039 |
| Great Britain and Colonies | 7,427.342 |
| Italy | 10,329 |
| Japan | 17.501 |
| Russia | 1,159,704 |
| Spain | 260.450 |
| Sweden | 462.809 |
| United States | 6,657,388 |
| | 25,295,724 |

Great Britain and U. S. are given in tons of 2,240 lbs. and the other countries in tons of 2,204 lbs. Austria-Hungary, Japan, Russia, and Spain is the product of 1893, the other countries of 1894. In 1895 U. S. produced 9,346,606 tons.

For the conversion of pig-iron into soft or hard steel, and other methods of making steel, see STEEL.

**Iron,** RALPH. See SCHREINER, OLIVE.

**Iron Age.** Period following the Bronze Age. Iron was known in Egypt under the Pyramid Dynasties 4000 B.C., but its introduction into general Mediterranean use may have been as late as 1200 B.C. In n. Europe its use was not general until the Christian Era. It is to these centuries, and to countries outside the limits of Greek and Roman culture, that the term is especially applied, mainly to Scandinavia. The term does not imply the abandonment of bronze, but simply the preference for or general use of iron. Although the Iron Age implies a country exterior to the boundaries of Greek or Roman government, mediate or remote influences of Greek or Roman culture will always be found in countries to which the term applies; *e.g.*, those of Scandinavia.

**Iron Alum.** $KFe(SO_4)_2+12H_2O_1$. Made by bringing molecular weights of potassium and ferric sulphates together in solution; similar to the alums in general. It is used in dyeing and calico printing.

**Ironclad.** See ARMOR PLATES FOR WARSHIPS.

**Iron Cross.** Order founded in Prussia 1813 to reward military services against Napoleon; reorganized 1870.

**Iron Crown.** Of Lombardy; used repeatedly since 591, and by Napoleon 1805; represented on his Italian coins.

The Iron Crown of Lombardy.

**Iron Crown,** ORDER OF THE. Founded by Napoleon as King of Italy, and after his fall adopted by Francis I. of Austria.

**Iron Disulphide.** See IRON PYRITES.

**Iron Hat.** See GOSSAN.

**Iron Law** OF WAGES. Economic law formulated by Ricardo, that wages always tend to a minimum rate, just sufficient to supply the physical needs of the laborer and of his children who are too young to work; so called by Socialists.

**Iron Liquor.** Aqueous solution of ferrous acetate, produced from acetate of lead or lime by the addition of copperas. Sulphate of lime precipitates and is removed by settling. It is used in dyeing.

**Iron Mask.** Really of black velvet, with iron springs; worn by a French state prisoner, confined 1679–81 at Pignerol, and later at Exilles, Ste. Marguerite, and in the Bastile, where he d. Nov. 19, 1703. He has been variously identi-

The Iron Mask.

fied as a conspirator against Louis XIV., an illegitimate son of Anne of Austria, a brother or son of Louis XIV., and other persons. A letter of Louis XIV., deciphered 1893, points to Gen. de Burlonde, who raised the siege of Conti without the king's permission.

**Iron Pile.** Hollow iron cylinder furnished with a screw, disk, or shoe, at its lower end, and sunk in the earth to form the foundation for a structure.

**Iron Protoxide.** See FERROUS OXIDE.

**Iron Pyrites.** $FeS_2$. Yellow iron sulphide, crystallizing in the isometric system, and known mineralogically as pyrite. The name sometimes includes PYRRHOLITE and MARCASITE (q.v.).

**Iron Rope.** Made of twisted strands, usually seven,

arranged around a central strand of hemp to give flexibility. The number of wires in a strand is either seven or nineteen.

**Iron Sesquioxide.** See FERRIC OXIDE.

**Ironsides.** Cromwell's regiment in the Civil War 1642–53; afterward, all veterans of the Parliamentary army.

**Ironsides,** OLD. U. S. frigate *Constitution*, popularly so called.

**Ironstone.** See CLAY IRONSTONE.

**Iron Sulphide.** See FERROUS SULPHIDE and IRON PYRITES.

**Ironton.** Capital of Lawrence co., O.; on the Ohio; business center of an iron and coal region. Pop., 1890, 10,939.

**Iron-Weed.** Coarse herbs of the genus *Vernonia*, of the Composite family, natives of e. and tropical America.

**Iron Wire.** Rods from ¼ to ½ inch in diameter are reduced in grooved rolls to a coarse wire and then passed through the successive holes in a draw plate. The tensile strength of wrought-iron wire is greater than that of rods and bars, often reaching 80,000 to 100,000 lbs. per sq. in.

**Ironwood.** See HORNBEAM.

**Iroquois.** Indians of central N. Y., including the five nations, Mohawks, Oneidas, Onondagas, Cayugas, and Senecas; supposed to have come from Canada ab. 1600, driving the Shawnees before them. They sent out war parties in every direction. The linguistic stock was distinct from the Algonquin, but included scattered tribes (Hurons, Eries, and in N. C. the Tuscaroras), against which the confederacy warred. Remnants of southern Iroquois joined the northern confederacy in 1713. The five (six) nations were allies of the English. They worshiped the sun and moon, and were successful agriculturists.

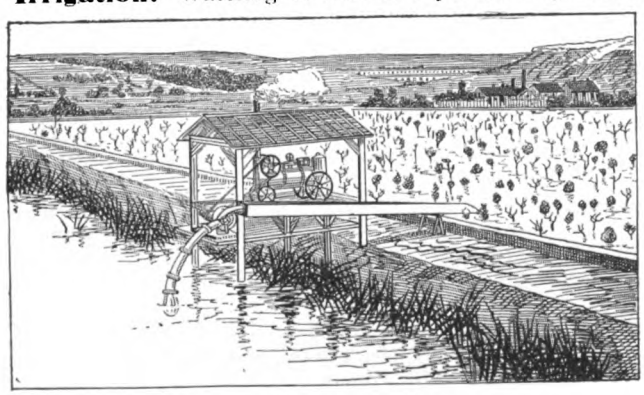
Iroquois Chief.

**Irradiation.** When the image of a bright object is formed upon the retina of the eye, the sensation produced extends somewhat outside of the true boundaries of the image. Its effect may be perceived in the apparent magnitude of stars, which usually seem much larger than they are. Plateau found that it differs for different people and at different times.

**Irregularia.** See EXOCYCLICA.

**Irregular Troops.** Those in the pay of a State, but not belonging to its regular forces; *e.g.*, regiments of cavalry raised in the East Indies under condition that each man should provide his own horse, arms, accouterments, and clothing, in return for monthly pay from the British Government.

**Irrigation.** Watering of land in dry seasons by ditches and canals leading from storage reservoirs. In India ab. 25,000,000 acres are irrigated, in Egypt 6,000,000, in Italy 3,500,000, and in the U. S. nearly 4,000,000. The average annual cost of the water in the U. S. is $1 per acre, and the average first cost of the necessary reservoirs and canals $8.15 per acre. The effect of irrigation has been to raise the value of land from $3 to $83 per acre. Irrigation is usually necessary in regions where the annual rainfall is less than 20 inches. It is necessary in most of the Western States from the middle of April to the middle of August. One cubic foot of water per second will irrigate from 60 to 100 acres in Colorado, Utah, and Idaho, and in s. Cal. from 100 to 300 acres. Large storage reservoirs are constructed to collect the rainfall, which at the proper time is distributed by main and lateral canals. The Turlock canals in California have a main 80 m. long, of which 560 ft. is in rock tunnel, with laterals 180 m. in length. Very large dams, both of earth and of masonry, are often needed to form the storage reservoirs. Underground tunnels are sometimes built from which water is pumped. A permanent effect of irrigation is to increase the supply of ground water and promote the growth of shrubs and trees. Irrigation is ancient art, practiced by Latin, Indian and Mongolian races.



Inundating Vineyard with Centrifugal Steam Pump.

**Irritant.** That which causes irritation or pain, heat and tension, either mechanically as scarification or puncture, chemically as alkalies and acids, and specifically as cantharides.

**Irtish River.** Branch of the Obi, in w. Siberia. It rises in the Altai Mountains and flows generally n.w. Length ab. 1,650 m.

**Irvine,** WILLIAM, 1741–1804. Officer in the War of Independence: M.C. from Pa. 1786–88 and 1793–95.

**Irving,** EDWARD, 1792–1834. Founder of the CATHOLIC APOSTOLIC CH. (q.v.). He was Dr. Chalmers' assistant in Glasgow 1819–22, and then Presb. pastor in London till deposed 1833. A man of genius, the friend of Carlyle, admired by Coleridge, he was fascinated by the idea of reviving the primitive Ch., and would allow no change from that model. The supposed reappearance of the gift of tongues 1830 supplied what was needed, and in 1832 he took part of his congregation to a new abode. His works were collected in 5 vols. 1864–65.

**Irving,** SIR HENRY, LL.D. (orig. JOHN HENRY BRODRIBB), b. 1838. English actor; manager of the Lyceum, London, 1878; well known in America since 1883; knighted 1895. His first eminent success was won as Mathias in *The Bells*, 1871. Among his chief parts are Hamlet, Othello, Shylock, Romeo, Macbeth, and Richard III. He has delivered sundry lectures and addresses, and pub. *Impressions of America*, 1884.

**Irving,** ROLAND DUER, Ph.D., 1847–1888. Prof. Univ. Wis. 1870; assistant State Geologist 1873–79; especially known for his researches in Lake Superior regions.

**Irving,** WASHINGTON, LL.D., 1783–1859. First highly successful American author; resident in Europe 1815–32; Minister to Spain 1842–46. With J. K. Paulding he wrote *Salmagundi*, 1807, and with his brother PETER (1771–1838) a burlesque *History of New York, by D. Knickerbocker*, 1809. His first great success was *The Sketch-Book*, 1818, including *Rip Van Winkle* and *Sleepy Hollow*. Then came *Bracebridge Hall*, 1822; *Tales of a Traveler*, 1824; *Life of Columbus*, 1828; *Conquest of Granada*, 1829; *Companions of Columbus*, 1831; *The Alhambra*, 1832. At home he wrote *Tour on the Prairies* and *Abbottsford*, 1835; *Astoria*, 1836; *Captain Bonneville*, 1837. His latest works were a *Life of Goldsmith*, 1846–49; *Mahomet and his Successors*, 1850; *Wolfert's Roost*, 1855; and *Life of Washington*, 5 vols., 1855–59. His later years were passed at Sunnyside, near Tarrytown, N. Y.—His brother WILLIAM (1766–1821) wrote parts of *Salmagundi*, and was M. C. 1813–18.

**Is.** Ancient town of Asiatic Turkey, 90 m. n.w. of Bagdad on the Euphrates, now called Hit. The inhabitants export bitumen and naphtha from pits which were worked by the early inhabitants. Pop. 5,000.

**Isaac.** Son of Abraham and Sarah, husband of Rebekah, and father of Jacob and Esau.

**Isaac** OF ANTIOCH, d. ab. 460. Syrian poet and controversialist.

**Isaac I.,** COMNENUS, d. 1061. Byzantine emperor 1057–59; reformer and able ruler; writer on Homer. He retired to a convent 1059.

**Isaac II.,** ANGELUS, d. 1204. Byzantine emperor 1185–95; dethroned and blinded by his brother Alexius; restored 1203.

**Isabella.** Port 38 m. n.w. of Santiago on the island of Haiti, where Columbus in 1493 established the first European

settlement in the New World. Only the ruins remain to mark its site.

**Isabella I.,** 1451–1504. Queen of Castile; married to Ferdinand of Aragon 1469. She succeeded her brother Henry IV.

Isabella I.

1474, thus uniting the two kingdoms, though she ruled Castile. She encouraged the venture of Columbus 1492.

**Isabella II.,** b. 1830. Daughter of Ferdinand VII.; Queen of Spain 1833; deposed 1868.

**Isabey,** EUGÈNE LOUIS GABRIEL, 1804–1886. French landscape and marine painter of great power.—His father, JEAN BAPTISTE, 1767–1855, was an eminent painter of portraits and miniatures.

**Isadelphous.** Flowers whose stamens are united by their filaments in clusters, and of the same number in each cluster.

**Isæus,** ab.420–ab.350 B.C. Greek lawyer at Athens, writer of orations delivered by others. Eleven of these remain.

**Isaiah.** Twenty-third O.T. book, containing the prophecies of Isaiah, writing ab. 759–700 B.C., and in Ch. XL.–LXVI. those of a yet greater though nameless prophet, the most gifted of Hebrew poets, living in Babylon ab. 540 B.C., commonly called the O. T. Evangelist, as so evidently foretelling the advent of Christ. No more fervent, stirring, and uplifting strains are to be found in ancient literature.

**Isambert,** FRANÇOIS ANDRÉ, 1792–1857. French lawyer and author; Deputy 1830–48; active against slavery. He edited *Recueil des Anciennes Lois Francaises*, 29 vols., 1821–33, and tr. Josephus and Eusebius. *Hist. Justinian*, 1856.

**Isametral.** Line connecting places on the earth's surface having the same abnormal climatic features during any year or season. The term was introduced 1865 by Dove.

**Isandula,** or ISANDHLWANA, BATTLE OF. In S. Africa, Jan. 22, 1879. The British camp was attacked by 18,000 Zulus, and most of its defenders slain.

**Isanemone.** Lines connecting places having equal wind velocity or wind force.

**Isanomal.** Lines connecting points of equal anomalies; also lines of equal departures; term used 1852 by Dove.

**Isanther.** Lines connecting places at which a given plant blossoms on the same day; term introduced ab. 1850 by Quetelet.

**Isar.** Branch of the Danube, rising in Tyrol and flowing n. and n.e. through Bavaria. Length 220 m., drainage area ab. 3,545 sq. m.

**Isatin.** $C_8H_5NO_2$. Yellowish prisms, prepared by the oxidation of indigotine by means of nitric acid. It gives with alkalies the salts of an acid, called isatinic acid. It is made from orthoamidobenzoic acid, and yields indigo when treated with reducing agents.

**Isauria.** Region of s. Asia Minor, about Mt. Taurus; anciently occupied by robbers and pirates, who were temporarily subdued by Servilius 76 B.C., and driven from the sea by Pompey. The Emperors Zeno I., 474–491, and Leo III., 718–741, were of this race.

**Ischia.** Island in Bay of Naples, noted for fine scenery and mineral springs; repeatedly devastated by earthquakes and eruptions, as 474 B.C., 1302, 1881, and 1883. Area 26 sq. m.; pop. ab. 25,000.

Ischia.

**Ischial Callosity.** Callous area on the buttocks of certain monkeys.

**Ischiopodite.** Proximal joint of the endopodite, third from the body, in the walking legs of Crabs.

**Ischium.** Portion of the innominate bone which extends downward and upon which the body rests while sitting.

**Iseult,** or ISOLDE. See TRISTRAM.

**Ishmael.** Son of Abraham by Hagar the Egyptian; accepted as their principal ancestor by the Arabs.

**Ishpeming.** City of Marquette co., Mich., in a region of iron mines. Pop., 1890, 11,197.

**Isidore** OF CHARAX, on the Tigris, 1st century. Geographer. *Parthian Itinerary.*

**Isidore** OF PELUSIUM, in Egypt, ab. 365–ab. 435. Head of a monastery; author of 2,012 letters, still extant.

**Isidore** OF SEVILLE, ab. 560–636. Bp. of Seville 600, a man of commanding influence, and a prolific writer. His *Origines* and some historical and doctrinal works survive.

**Isidorian Decretals.** See PSEUDO-ISIDORIAN DECRETALS.

**Isinglass.** Best quality of fish glue. See GLUE. The name is often improperly given to mica.

**Isinglass,** JAPANESE. Vegetable jelly derived from a red seaweed of the genus *Gelidium.*

**Isis.** Nature goddess of the Egyptian pantheon; sister-wife of Osiris, and mother of Horus, whom she is frequently represented holding as a child upon her lap; worshiped at Rome under the empire.

Isis.

**Isla,** JOSÉ FRANCISCO, 1703–1781. Spanish Jesuit, exiled with his order 1767; author of a notable satire on the ignorant preaching friars, *Fray Gerundio de Campazas*, 1758–70, which has been compared to *Don Quixote*. He wrote other books, tr. *Gil Blas*, and was a preacher of mark.

**Islam.** See MOHAMMEDANISM.

**Island.** Body of land, distinguished from a continent only by its size. Islands are usually divided into two classes: continental, which are located near continents, and apparently owe their elevation to the same uplifts which have raised the continents; and oceanic islands, which are at a distance from continents. The latter are mainly comprised in two sub-classes; those which are the product of volcanic forces, and those which are the work of coral polyps.

**Island No. Ten.** In the Mississippi; taken by Union forces April 8, 1862. The siege began March 16.

**Island of Saints.** Ireland; so called in the Middle Ages from its numerous monasteries and the great number of missionaries who went from them to other parts of Europe.

**Islay.** One of the s. Hebrides, w. of Jura. Area 246 sq. m.; pop., 1890, 7,559, formerly much larger.

**Isle of France.** See MAURITIUS.

**Isle of Man.** See MAN, ISLE OF.

**Isle of Wight.** See WIGHT, ISLE OF.

**Isles,** LORD OF THE. See LORD OF THE ISLES.

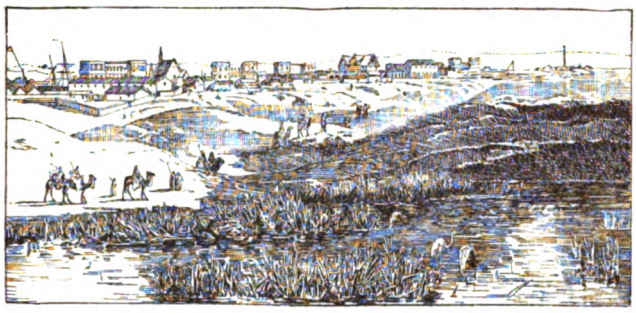
**Isles of Shoals.** Near Portsmouth, N. H.; celebrated by Mrs. Celia Thaxter, who lived on Appledore I.

**Islington.** Suburb of LONDON (q.v.). Pop., 1891, 319,433.

**Isly.** In n.w. Africa. Scene of Abd-el-Kader's defeat by the French under Bugeaud, Aug. 14, 1844.

**Ismail.** Town of Bessarabia; 48 m. from mouth of the Danube; taken by storm Dec. 22, 1790, after a long siege by the Russians, who lost 20,000 men; whereupon Suwarrow slew the Turkish garrison of 30,000, and gave the city up to pillage; again taken by the Russians Sept. 26, 1809; ceded to Moldavia in 1856, and to Russia 1868.

**Ismailia.** Town of Egypt, on Lake Timsah, once important as headquarters of Suez Canal construction. Formerly



Ismailia.

much subject to fever due to a marsh, but which is now dry and the fever has disappeared. Pop. ab. 4,000.

**Ismailis.** Mohammedan sect, formed in Persia or Syria ab. 770, and most important ab. 880–1100; credited with frightful heresies and crimes.

**Ismail Pasha,** b. 1830. Khedive of Egypt; son of Ibrahim Pasha; commander of the army 1862; Viceroy 1863; entitled Khedive 1867. He extended his rule over the Upper and White Nile 1868–69; became virtually independent of Turkey 1873; defeated the Sultan of Darfur 1874; promoted the Suez Canal, public works and manufactures, but nearly wrecked the finances of the country by his prodigality; was deposed June 26, 1879; and has since lived in Italy.

**Ismid.** Town of n.w. Asia Minor, the ancient NICOMEDIA (q.v.).

**Isnard,** MAXIMIN, 1751–1830. French Girondist, Deputy 1891–93.

**Isoamyl Alcohol.** See AMYL ALCOHOL.

**Isobaric.** Line drawn on a chart through those places at which the barometric pressure is the same at any given moment. By plotting a system of isobars, the barometric condition of an extensive region is rendered intelligible at a glance.

**Isobeths,** or ISOBATHYMETRIC. Lines connecting places having the same depth below mean sea level.

**Isobrontes.** This term is more generally used than HOMOBRONTES (q.v.). Ferran applies the term to the lines connecting points at which the maximum phase of the thunderstorm occurs simultaneously.

**Isobutyl Alcohol.** $(CH_3)_2$:CH.$CH_2$OH. Bpt. 108.5° C. Formed to a small extent in the preparation of common alcohol by fermentation; liquid with fusel oil odor, obtained by the distillation of FUSEL OIL (q.v.). It yields isobutyric acid on oxidation.

**Isobutyric Acid.** $(CH_3)_2$:CH.COOH. Bpt. 154° C. Found in the *Arnica montana* and other plants free and combined; liquid of very disagreeable odor, prepared from isobutyl alcohol by oxidation. It closely resembles BUTYRIC ACID (q.v.).

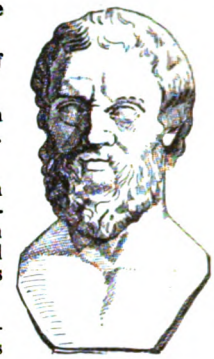
**Isochronous.** Vibrating body when it performs its oscillations in the same time, whatever be the amplitude. Whenever a body is vibrating under the action of a force which is proportional to the displacement, the vibrations are isochronous.

**Isochronous Governor.** See GOVERNOR.

**Isochrous.** Organs or organisms of uniform color all over.

**Isoclinic Line.** Lines drawn through points upon the earth having equal dip. See INCLINATION.

**Isocrates,** 436–338 B.C. Athenian orator and teacher of rhetoric, who endeavored to arouse Greece to union against Persia. Twenty-one speeches and several letters survive. Cicero praises him as a brilliant orator.

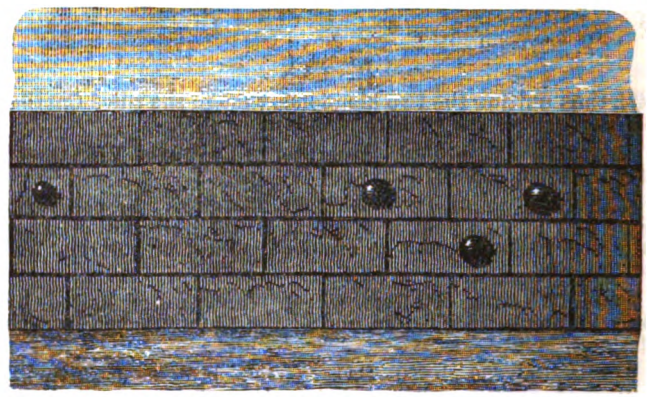


Isocrates.

**Isocyanic Acid.** O:C:N.H. Hypothetical acid. Its salts and organic ethers only are known.

**Isodiametric.** Cells of parenchyma which are of nearly the same dimensions in either direction.

**Isodomon.** Variety of masonry used in the best period of Greek architecture, in which the blocks were of equal length



Isodomonic Mode of Construction.

and thickness and placed so that the joint in one course came in the middle of a block below it.

**Isodynamic.** Locus of the equation which expresses the relation of the pressure and volume of any body when it passes through heat changes in such a manner that the internal energy remains constant.

**Isodynamic Curve.** One whose ordinates represent the variation in pressures of a gas undergoing changes of volume by expansion or compression, when the interior work of the gas remains constant as the exterior work varies. That is, all the heat is supplied which is to be converted into exterior work in expansion, and in compression there must be withdrawn by refrigeration an amount of heat corresponding to the work of that compression. For the permanent gases for which the Mariotte–Gay-Lussac law applies, the isodynamic curves coincide with the isothermal curves.

**Isodyne.** Surfaces of equal wind force in the atmosphere; term used 1887 by Diro-Kitao.

**Isoetaceæ.** Order of *Pteridophyta*, comprising the Quillworts, plants of grass-like aspect, growing in the mud or sand in the bottoms of lakes or streams. See HETEROSPOREÆ.

**Isogamy.** Conjugation of similar gametes.

**Isogeotherm.** Line connecting places on the earth's surface having the same temperature at any given depth below the surface of the ground during any given time.

**Isognathous Dentition.** Having the molars in both jaws of the same width, as in the following Bunodonts: man, swine, mastodon; and the Lophodonts: elephant, squirrel.

**Isogonic Line.** See DECLINATION OF THE NEEDLE.

**Isogonism.** Occurrence of biological species, apparently closely related structurally, in widely separated groups. See ANALOGOUS VARIATION.

**Isohyetals.** Lines connecting points at which the same quantity of rain has fallen during a given time.

**Isohyps,** or ISOHYPSOMETRIC. Lines connecting places having the same altitude above mean sea-level.

**Isomastigoda.** Order of *Lyssoflagellates*, having two to

five equal flagella. They are monaxial and asymmetrical, naked, or enveloped in a common cœnobium. The forms included have holozoic nutrition and are colorless; but parallel forms occur containing chlorophyl and placed by botanists with the *Algæ*. They constitute the group *Phytomastigoda; e.g.*, VOLVOX (q.v.).

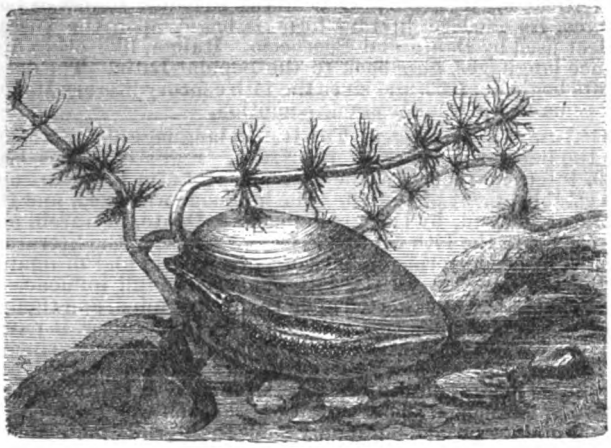
**Isomerism.** Isomers are compounds of like percentage composition, but of different physical and chemical properties. In the narrower sense, they contain the same number of atoms of each element in the molecule. Thus para- and ortho-toluidine, $C_6H_4:(CH_3)NH_2$; the para compound is a solid melting at 45° C., while the ortho is a liquid. Isomers differ in the arrangement of the atoms which make up the molecule. Stereo-isomers are compounds composed of the same number and kind of atoms but having different properties, owing to the different positions which the atoms occupy in space.

**Isomerous.** Flowers when all the parts are equal in number; equivalent to symmetrical flower.

**Isometric Projection.** Method of representing objects upon three planes whose intersections form axes inclined at 120° with each other. Three sides of a body can thus be shown in one view, the effect being that of a distorted perspective. It is used to give a clearer idea of an irregular object than can be obtained from an orthographic projection.

**Isomorphic.** Of equal rank structurally.

**Isomya,** or HOMOMYARIA. Division of asiphoniate Lamellibranchs, including forms having the posterior and anterior shell-closing (adductor) muscles of nearly equal size; *e.g.*, *Unio*



Isomya (*Anodonta cygnea*).

and *Anodon* (of group *Anodonta*), or fresh-water clams. Some siphoniate clams, as *Venus mercenaria*, the common hard or round clam (quohaug) of N. J. coasts, are also homomyarian.

**Isonephs.** Lines connecting regions having the same percentage of cloudiness.

**Isonitrides.** Isocyanides; salts of the hypothetical acid C:N.H.

**Isopag.** Lines connecting places at which a river, harbor or lake is covered with ice during the same number of days continuously in winter; termed applied 1887 by Rykatscheff.

**Isopektek.** Lines connecting places at which the first ice of winter or autumn in rivers and harbors forms on a special day: term applied 1887 by Rykatscheff.

**Isopleth.** Curved lines in the plane of the axes of ordinates and abscissas, representing the projection of horizontal sections of a curved surface. The abscissas and ordinates represent two coexistent quantities (as latitude and longitude, or time of day and time of year, or time of day and altitude above ground) that fix the date or place of any occurrence; numbers are then entered at each point, representing the nature of that occurrence (as time of sunrise, altitude above sea, temperature of the air), and isoplethic lines are drawn connecting points that have equal numbers (as isohyps and isobeths, or contour lines, isobars, isotherms). This term was introduced 1880 by Vogles, but curves of this nature had long been familiar to topographers, and had been used by meteorologists.

**Isopleura** (AMPHINEURA). Section of *Gastropoda*, including forms with the gills on the two sides of the body equal and the nerves parallel and straight. The *Polyplacophora*, *Neomeniæ* and *Chætoderma* are included. The group is a connecting link between the Gephyrean worms and *Mollusca*. *Chætoderma* is usually placed with the *Gephyrea*. It is externally characterized by possessing calcareous spines set in a chitinous integument; the foot is rudimentary, and there is only one tooth on the radula.

**Isopoda.** Group of *Arthrostraca*, with broad bodies (vertically flattened) with 7 movable thoracic segments, bearing legs that are alike, and with a short abdomen, which has locomotor appendages in the *Anisopoda*, and homologous appendages modified into gill-lamellæ in the *Euisopoda*. The latter tribe includes most of the forms. *Oniscus*, the wood-louse, is an example.

Armadillo vulgaris and Oniscus scaber.

**Isopola.** See HOMOSTAURA.

**Isopropyl Alcohol.** $CH_3.CHOH.CH_3$. Bpt. 83° C. Secondary propyl alcohol, prepared from isopropyl iodide by the action of oxide of lead. It gives acetone upon oxidation.

**Isopurpurin.** See ANTHRAPURPURIN.

**Isorropic Lines.** Those joining all points whose position, expressed as a function of two or more variables, has the same value. If the function is of the first degree, the isorropic lines will form a system of parallel straight lines.

**Isosceles Triangle.** One having two equal sides.

**Isospondyli.** Group of physostome fishes, including forms with pelvic fins abdominal in position, with four gills, and a cleft behind the last. The neck vertebræ are separate; a precoracoid is present, but no auditory ossicles (otoliths) nor interclavicles. The group includes the Herring family (*Clupeidæ*), the Salmon family (*Salmonidæ*), the Lady fishes (*Albulidæ*), and Trout Perch (*Percopsidæ*).

**Isosporeæ.** Division of the *Pteridophyta*, comprising such of those plants as produce but a single kind of spore, as the Ferns, Clubmosses, and Horsetails.

**Isostasy.** Condition of equilibrium in which the solid crust of the earth must exist if resting on a semi-liquid or viscous central mass.

**Isostaura.** See HOMOPOLA.

**Isostemonous.** Flowers which have but a single series of stamens, these being equal to or fewer than the lobes of the calyx; called also Haplostemonous.

**Isosulphocyanic Acid.** See MUSTARD OIL.

**Isotak.** Lines connecting places at which rivers or harbors become simultaneously freed from ice by the melting in spring.

**Isotalantosen.** Lines of equal variation of temperature, whether of individual observations or monthly or annual means; term introduced 1865 by Supan, and applied only to localities near sea-level, inhabitable by plants and animals.

**Isothermal.** If the physical state of a body, as defined by its volume v and pressure p, varies in such a way that its temperature remains constant, the body is said to undergo an isothermal change. An isothermal curve is the locus of the equation, indicating the relation of volume to pressure during the change. That is, in expanding, an amount of heat must be added at each instant during the expansion, or abstracted during compression. For the permanent gases, these curves are equilateral hyperbolas. The equation is of the form $p\,v=c$, in which c has different constant values for the different isothermals.

**Isotherms,** or ISOTHERMAL LINES. Lines connecting places on the earth's surface that have the same atmospheric temperature, whether of the year, month, day, or moment; term introduced 1817 by Humboldt.

**Isotropic.** The substance of a homogeneous solid is called isotropic when a spherical portion of it, tested by any physical agency, exhibits no difference in quality, however it is turned. A substance exhibiting differences in quality in different directions is called Æolotropic.

**Isouard,** NICOLÒ, 1775–1818. Italian opera composer whose best successes were made in the comic genre and in Paris. *L'avviso ai Maritati; Artaserse; Le tonnelier; Michel Ange; Cendrillon; Jeannot et Colin; Joconde.*

**Isovaleric Acid.** $(CH_3)_2:CH.CH_2.COOH$. See VALERIC ACIDS.

**Ispahan.** Ancient city of Persia, on the Zendeh; capital of province Irak-Ajemi. It was taken 1387 by Timur, who is said to have raised a skull-tower of 70,000 heads at the gate. It attained its greatest prosperity under Shah Abbas, who made it his capital 1590. It was sacked by Afghans 1722, and

retaken 1729 by Nadir Shah, but fell into decay when Teheran became the capital. Pop. in 17th century estimated at 600,000 to 1,000,000; now ab. 50,000. It lies on the main route to India;

College of Sultan Husein at Ispahan.

its manufactures are of higher reputation than the courage and morals of its people. It contains the finest specimens of modern Oriental architecture and decoration in Persia, but much of it is in ruins.

**I Spy.** Children's game, in which a concealed player calls out Whoop, and the rest seek him. After being discovered, he pursues the others and endeavors to touch them before they reach Home. On discovering him the seeker cries, I spy the wolf, to warn the other seekers.

**Israel.** 1. Surname of the patriarch Jacob. 2. The twelve tribes of his descendants. 3. Kingdom originating in the revolt of the Ten Tribes from the House of David. 4. The Christian Church, as spiritually descended from Jacob.

**Israelites.** See HEBREWS.

**Israels,** JOSEF, b. 1824. Dutch genre painter of high rank.

**Issachar.** Ninth son of the patriarch Jacob, and ancestor of one of the 12 tribes.

**Issue.** Surface or channel kept in an ulcerating condition to relieve inflammation in the parts beneath.

**Issue.** 1. All legitimate descendants. 2. Question in controversy between parties to a litigation, as shown by the pleadings. It may be one of law, to be determined by the court upon the pleadings alone, or one of fact, to be determined upon the evidence thereafter adduced.

**Issus.** Ancient city in s. e. Cilicia; scene of Alexander's defeat of Darius 333 B.C.

**Issy.** Suburb of Paris; scene of Davout's defeat by Blucher July 3, 1815.

**Isthmian Games.** Celebrated on the Isthmus of Corinth in a pine grove sacred to Poseidon; originally octennial, after 580 biennial. The contests were nearly the same as at Olympia, including rhetorical, poetical, and musical exhibitions; the prize was a garland of pine leaves, afterward an ivy wreath, then pine again. By a law of Solon, every Athenian victorious at the Isthmus received 100 drachmæ. The games continued till 393.

**Isthmus.** Neck of land connecting two larger portions, as those of Panama, Suez, and Corinth.

**Itacolumite.** Sandstone containing, with the quartz grains, scales of mica, frequently so arranged as to impart to the stone a marked degree of flexibility, whence the name flexible sandstone. The term is of Brazilian origin; the stone has been thought to be the home of the diamond. It is found also in the s. Appalachians.

**Itagaki,** TAISUKE, b. 1838. Japanese general 1868, Privy Councilor 1871, Minister of State 1878, Count 1887.

**Italian Architecture.** The chief historical styles of architecture have left examples in Italy, the first being the aboriginal, or Etruscan, afterward converted by the admixture of elements imported from Greece into the classical or Greco-Roman. The Romanesque, practiced in Italy from the fifth to the fifteenth century, and distinguished in part by addition of Byzantine forms, produced many interesting monuments. The Gothic was imported from the North, and scarcely attained an independent development, except in a few churches, as at Sienna, and in the domestic architecture of Venice and of n. Italy in general. What is commonly designated as Italian architecture, however, is the revived Classic, introduced by Brunelleschi and Alberti, and carried on by their successors. This has extended, with national modifications, throughout Europe and all Christendom, has been employed for all purposes, and might properly be described as modern architecture.

Church of Santa Maria della Salute, Venice.

**Italian Language.** One of the so-called Romance languages: its modern literary form is based upon the Tuscan dialect used by Dante and Boccaccio. Italian, like other Romance languages, goes back to the popular Latin. The documents begin ab. 1000, and since the 14th century literary Italian has remained in a fairly stable condition.

**Italian Literature.** The Italian language and literature are the lineal successors of the Latin. Eight centuries, 500–1300, intervene between the last age of Latin literature and the establishment of Italian. The language was fixed, and the literature begun, by the great masters, Dante, Petrarch, and Boccaccio, in the 14th century. Before that age, the literature existed in crude forms, mainly of poetry, lyric and dramatic, and of the novelle. In the 15th century the full influence of the Renaissance was exerted upon the Italian mind, and though it produced no names so eminent as its predecessor, it paved the way for the appearance in the 16th century of such singers as Tasso and Ariosto, of political writers like Machiavelli, and of notable historians and novelists. The 17th century was a period of decadence and of false taste. Much was produced in poetry and the drama, but it only made the sterility more apparent. With the 18th century the dawn of a better day appeared, due, it is claimed, to the influence of the study of French models. Vico founded the new school of historic study in the application of philosophy to history. Metastasio in poetry, Alfieri in tragedy, and Goldoni in comedy; these restored something like the ancient renown. Contemporary Italian literature dates from 1815. It is specially rich in philosophy and history, and in the field of romance, both prose and poetic, it may boast high names.

**Italic Language.** The original group of the Aryan family of which Latin later asserted itself as the most prominent representative, and probably related more nearly to Hellenic than to any other Aryan tongues.

**Italy.** Kingdom of s. Europe, consisting mainly of the Italian peninsula and the islands of Sicily and Sardinia. The peninsula is traversed by the Apennines, while upon the borders of France and Switzerland are the Alps. The seacoast is somewhat broken, affording several fine harbors. The area is 110,623 sq. m. Agriculture and manufactures are in a backward state, yet much wine, olive oil, fruit, and silk are produced and exported. In 1893, 8,700 miles of railroad were in operation.

Ancient I. was divided into three parts, Northern, Central, and Southern, occupied by Gauls, Etruscans and Latins, and Greeks. Gradually Rome conquered and incorporated the whole peninsula. The n. boundary was not advanced to the Alps until 222 B.C. From that time I. was the center of the Empire till the removal of the capital to Constantinople, 324, after which it was ruled by viceroys. The weakening bond with Constantinople was finally ruptured 476.

Mediæval I. begins with Theodoric's kingdom of the Ostrogoths, 493–526. He was conquered by Belisarius and Narses, and the Emperor's authority re-established 536–574. N. Italy fell under the power of the Lombards 568–774. The aggressions of the Lombards induced the Bishop of Rome to summon the victorious Franks to his deliverance. This proved a most fateful alliance. The kingdom of the Lombards was overthrown; Charlemagne was crowned Emperor of the West

at Rome 800, and the foundation of the papal temporal power was laid. I. was merged in Charlemagne's Empire, except the s. extremity, which was divided between Greeks and Saracens. At the dismemberment of Charlemagne's Empire 887, I. fell under the sway of local feudal lords, until conquered by Otto I. 962. Then followed the long struggle of Church and Empire, resulting in the supremacy of the Church and the abasement of the Empire 1250. During this struggle, which convulsed all I., the Republics rose into prominence. Their monopoly of the Oriental trade had made them rich, and in the struggle between Pope and Emperor they achieved their independence, but proved unable to form a durable confederacy, and were rent with factional strife, which issued in the rise of the despots, 1300-1492. The absence of the Popes at Avignon 1309-76, and the Great Schism 1378-1414, with the feebleness of the Empire, secured to I. a season of internal tranquillity. This is the most brilliant and prosperous period of Mediæval I., 1300-1500. Five principalities had grown up, Milan and Venice in the north, Florence and the Papal States in the center, and the Kingdom of Naples (founded by Robert Guiscard and his Normans under

Ancient Italy, by Turner.

the suzerainty of the Pope 1053) in the south. A successful balance of power was maintained by the Medici of Florence, and the generous rivalry in art and literature formed an ideal bond of union. It is the period of the Renaissance, of the culmination of European art, of the Revival of Letters, and of the general awakening of the human mind, by means of which I. regained an ideal ascendency in Europe. This prosperous period was disturbed by the invasion of Charles VIII. of France 1494, to establish his claim in Naples. This was followed by the rivalry of the Emperor Charles V. and Francis I., and the disturbances occasioned by the outbreak of the Reformation. I. now became the battlefield of Europe. In 1527 Rome was sacked by the imperial army, largely composed of Lutherans, and Pope Clement VII. was imprisoned. In 1530 Spanish hegemony was established over all I.; 1520-1796 is the most inglorious period of Italian history. Under the supremacy of Austria a torpor overspread the country. Her territories became the barter of kings, in whose wars she suffered. The French Revolution threw I. again into confusion. Rome became a part of the French Empire. The old order was re-established at the Congress of Vienna 1815, but germs of independent nationality had been planted which were not to perish.

Modern I. dates from the rise of the House of Savoy to prominence. At the Congress of Vienna, Victor Emanuel was recognized as King of Sardinia. To this power the hopes of young I. gradually attached themselves; the names of Mazzini, Cavour, and Garibaldi are intimately associated with the achievement of national independence. The republican revolution of 1848 proved a failure, but the constitutional reforms of Victor Emanuel gained favor and solidity, while his union with the Allies in the Crimean War, 1854, won for the nascent kingdom consideration abroad. An alliance with Louis Napoleon against Austria caused the war of 1859, in which the expectations of I. were cruelly disappointed. In 1860 Central I. was annexed to the kingdom of Sardinia, and, through Garibaldi, the Sicilies. The alliance with Prussia, 1866, secured Venice. Only Rome remained. The victory of Sedan released Rome from French control, and Sept. 20, 1870, Victor Emanuel entered the city. After centuries of distraction and humiliation I. was emancipated and Rome again her capital. Pius IX. was allowed to occupy the Vatican. The government is a limited monarchy, under a king, with a Senate nominated by the king, and a Chamber of Deputies elected by the people. A triple alliance with Germany and Austria was formed 1882. The development of the country by railroads and other public works, with the effort to maintain a place among the leading powers of Europe, the army and fleet, and the African occupation, have entailed heavy and embarrassing expenses. Pop., 1892, 30,535,848.

**Itard,** JEAN MARIE GASPARD, 1775-1838. French physician and philanthropist, chiefly eminent as an aurist. *Diseases of the Ear*, 1821.

**Itasca Lake.** Source of the Mississippi; in Minn., 1,575 ft. above tide.

**Itch.** Any disease of the skin characterized by itching, especially SCABIES (q.v.). Bakers', grocers', and washerwomen's itch are eczematous affections brought on by kneading dough, handling sugar, etc.

**Ithaca,** or THEAKI. Island e. of Cephallonia, famous as the birthplace and home of Ulysses. Area 37 sq. m.; pop. 10,650.

**Ithaca.** City of Tompkins co., N. Y., on Cayuga Lake; founded 1821, chartered 1888. It contains Cornell Univ. Pop., 1890, 11,079.

**Itinerancy.** Methodist system, by which a pastor remains but one, two, or at most three years in one charge.

**Itineraries.** Descriptions of roads in the Roman Empire, put forth under Caracalla and later.

**Ito,** HIROBUMI, COUNT, b. 1840. Premier of Japan 1886-88 and 1892; author of the constitution of 1889; eminent for reforms and progressive views.

**Iturbide,** AGUSTIN DE, 1783-1824. Emperor of Mexico 1822-23. In Hidalgo insurrection 1810; he served in the royal army, but in 1820 put himself at the head of the National party, proclaimed the independence of Mexico 1821, and ruled from May 1822 to April 1823. After a year in Europe he returned and was executed.

**Itys.** Son of Tereus and Procne; slain by his mother and served in a dish before his father. Procne fled with her sister Philomela, pursued by Tereus; they were changed into a nightingale and a swallow.

**Iuka.** Town of Tishomingo co., Miss.; scene of a battle, Sept. 19 and 20, 1862, between Rosecrans and Price. Federal loss 782, Confederate 1,516. Pop., 1890, 1,019.

**Iulis.** See CHILOGNATHA.

**Ivan III.,** 1440-1505. Grandduke of Russia 1462; chief founder of the Empire.

**Ivan IV.,** "THE TERRIBLE," 1530-1584. Grandduke 1533, crowned as Czar 1547; noted for energy, ability, and cruelty.

**Ivernia.** Variation of Ierne or Hibernia.

**Ivica,** or IVIZA. Smallest of the Balearic Isles. Area 228 sq. m.; pop., 22,800.

**Ivory.** Strictly applied only to the material of the tusks of elephants, but in a more general sense includes the tusks of walrus, horn of narwhal, and the teeth of some *Cetacea*. That it was known to the ancients is shown on the Egyptian monuments. Pliny states that ivory was so plentiful in Ethiopia that it was used for fences, door-posts, and cattle stalls. African ivory is preferred to Asiatic, as it is of a closer texture and less liable to discoloration. The tusks are ab. 9 ft. long and 160 lbs.' weight. The color externally is usually yellow or dark-brown, but on the inside it is white. It is used in carving, to make billiard balls, handles of knives, piano keys, etc. Russia supplies a large amount of ivory, the remains of extinct varieties of elephants. This is called Fossil Ivory. It is composed of calcium phosphate 64, organic matter 24, water 11.15 and calcium carbonate 0.10. Artificial Ivory is produced in a number of ways, but nearly all contains caoutchouc, sulphur, and some white ingredient as zinc oxide, and gypsum. See IVORY CARVINGS and CELLULOID.

**Ivory Black.** Species of bone black made by the calcination of ivory. It is used as a pigment in the manufacture of paints and printers' ink.

**Ivory Carvings.** The paleolithic period of man in Europe has furnished surprisingly realistic drawings and carvings in this substance. These have been found in considerable numbers, especially in the caves of the Dordogne in France. In the Assyrian antiquities of the British Museum carved ivory plaques, probably used for furniture decoration, are very numerous. For the Greek use of ivory, see CHRYSELEPHANTINE STATUES. For Roman and early Christian use, see DIPTYCH and TRIPTYCH.

Ivory Carving, 5th Cent.

**Ivory Coast.** Tract of land in W. Africa forming part of Upper Guinea, extending from Cape Three Points to Cape Palmas. Parts of this

coast belong to France, Great Britain, and Liberia. The climate is hot and unhealthy. Ivory, formerly plentiful, is now scarce.

**Ivory,** JAMES, F.R.S., 1765–1842. English mathematician, Prof. Royal Military Coll. 1804.

**Ivory,** VEGETABLE. Nuts of the palm *Phytelephas macrocarpus*, native of n. South America. They are very hard and white throughout, and much employed as a substitute for ivory.

Fruiting Form of *Hedera helix*.

**Ivry.** Village 50 m. w. of Paris; scene of the decisive victory gained March 14, 1590, by Henry of Navarre over Mayenne and the forces of the League. Pop. 1,100.

**Ivy.** *Hedera helix*. Evergreen vine of the natural family *Araliaceæ*, native of Europe and Asia, much planted for ornament.

**Ivy,** AMERICAN. See VIRGINIA CREEPER.

**Ivy,** GROUND. See GILL.

**Ivy,** JAPANESE. *Vitis tricuspidata*. Vine of the Grape family, native of Japan; extensively introduced as a climber into Europe and N. America under the name *Ampelopsis veitchii*.

**Ivy,** POISON. *Rhus radicans*. Vine of the natural family *Anacardiaceæ*, native of N. America, the foliage poisonous to the touch; known also as Poison Oak and Climath.

**Ixion.** King of the Lapithæ. Purified from a treacherous murder by Zeus, he ungratefully attempted to win the love of Hera, and by a phantom made to resemble her became the father of a Centaur. He was punished in lower world by being bound hand and foot to an ever-revolving wheel.

**Ixodidæ** (TICKS). Family of *Acarina*. They have usually two simple eyes, live free in forests, and breathe by tracheæ. The females crawl on mammals and suck blood by means of a proboscis which bears recurved teeth. The pedipalps are five-jointed.

**Ixtlilxochitl,** FERNANDO DE ALBA, ab. 1568–1648. Mexican historian, descended from Aztec kings. His works are mostly in MS.

**Iycyasu,** TOKUGAWA, 1542–1616. Japanese shogun 1600; founder of a house which retained power till 1868. See DAIMIOS.

**Izalco.** Volcano, 19 miles n. e. of Sonsonate in the Republic of Salvador. First eruption March 29, 1793, and ever since almost continually active. Flames bursting from its summit have given it the name of the Lighthouse of San Salvador. Height ab. 5,000 ft.

**Izard,** RALPH, 1742–1804. M.C. from S. C. 1781–83; U.S. Senator 1789–95. *Correspondence*, 1844.

**Izcoatl,** d. 1436. Emperor of Mexico 1427.

**Izdubar.** Babylonian king of legend, celebrated in documents discovered 1872.

**Izmailov,** ALEXANDER, 1779–1831. Russian fabulist and poet.

**Iztaccihuatl.** Volcanic peak of Mexico. Altitude 15,708 feet.

# J

**Jabalpur,** or JUBBULPORE. Town of central India, 228 m. s.w. of Allahabad. Pop., 1891, 84,481.

**Jablochkoff Candle.** Form of electric arc-lamp, exhibited 1878 in Paris. The two carbons are placed side by side, instead of end to end as in the ordinary lamps, but are separated by a layer of kaolin. This is fused and dissipated as the carbons burn down, but serves as a conductor of high resistance to maintain the arc between the points. The current employed is an alternating one, as in that case the carbons are consumed at the same rate.

**Jablonski,** DANIEL ERNST, D.D., 1660–1741. German Moravian bishop 1699; noted scholar, grandson of Comenius.—His son, PAUL ERNST, 1693–1757, prof. at Frankfort 1721, wrote much on Egyptology.

**Jablonsky,** BOLESLAV, 1813–1881. Bohemian poet.

**Jaborandi.** *Pilocarpus jaborandi*. Shrub growing in e. Brazil, used in medicine for its diaphoretic properties. It contains the alkaloids pilocarpine, Jaborine and pilocarpidine.

**Jaccoud,** SIGISMOND, M.D., b. 1830. Prof. Paris 1883. *Traité de Pathologie interne*, 1871–88; *Clinique medicale de la Pitié*, 4 vols., 1885–88.

**Jacinth.** See HYACINTH.

**Jack.** Portable apparatus for lifting heavy weights by the help of a screw, lever, or hydrostatic press.

**Jackal.** Fox-like species of wild dogs of the Old World, analogous to the coyote of the New. They hunt small game in packs by night, and as scavengers follow the lion or prowl through towns, uttering unearthly screams. They are easily tamed. *Canis aureus* inhabits Asia from the Mediterranean to Ceylon. It is grayish-yellow, with tawny shoulders and haunches, 15 in. high, and 2 ft. long, exclusive of moderately

Jackal (*Canis aureus*).

short bushy tail. *C. anthus* is African. A species in Abyssinia is known as a wolf.

**Jack-a-Lantern.** See IGNIS FATUUS.

**Jackass,** LAUGHING. See LEVIROSTRES and ALCEDINIDÆ.

**Jackdaw.** See DENTIROSTRES.

**Jacket of a Gun.** The high-powered breech-loading rifled gun is built up on a central steel tube for a foundation. The next exterior steel tube, covering the breech and extending

ITALY
Geographical Miles
0 10 20 30 40 50 60
English Miles, 69 to a Degree.
0 10 20 30 40 50 60 70 80 90 100
Railways shown thus
SWITZERLAND
AUSTRIA
MEDITERRANEAN SEA
AFRICA
Gulf of Genoa
Gulf of Venice
G. of Trieste
G. of Cagliari
G. of Palmas
G. of Squillace
G. of Castel a Mare
Strait of Messina
LIPARI ISLANDS
STROMBOLI
PANARIA
USTICA
ALICUDI
FELICUDI
SALINA
LIPARI
VULCANO
PANTELARIA
GOZO
COMINO
MALTA (British)
Valetta
Città Vecchia
Longitude East from Greenwich

a short distance in front of the trunnions, is the Jacket. It is shrunk on the rifled tube, and when cooled exerts a pressure upon it. Upon this jacket and the muzzle portion of the tube hoops are shrunk, to complete the gun.

**Jack-Fruit.** *Artocarpus integrifolia.* Tree of the Bread-fruit family, native of the E. Indies; extensively grown for its large, edible fruit.

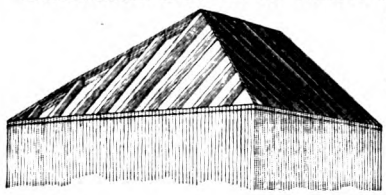
**Jackhead Pit.** Well or small shaft in a mine.

**Jackhead Pump.** One working in a jackhead pit; or auxiliary pump for any special service.

**Jack-in-the-Pulpit.** See TURNIP, INDIAN.

**Jack Rabbit.** See HARES and RABBITS.

**Jack Rafters.** Small rafters or joists resting upon the purlins which connect the main roof trusses.



Jack Rafters.

**Jack Screw.** See JACK.

**Jackson.** Capital of Jackson co., Mich., near the head of Grand River; founded 1830, chartered as a city 1857. Pop., 1890, 20,798.

**Jackson.** Capital of Miss.; in Hinds co., on Pearl R., 45 m. e. of Vicksburg. In 1863 it was taken by Union forces May 14, and in large part burned July 17. Pop., 1890, 5,920.

**Jackson.** Capital of Madison co., Tenn., on s. fork of Forked Deer R. It contains two colleges. Pop., 1890, 10,039.

**Jackson,** ANDREW, 1767–1845. Seventh Pres. U. S.; M.C. from Tenn. 1796, Senator 1797 and 1823, Judge Tenn. Supreme Court 1798–1804; Major-gen. of militia 1812, and of U. S. troops 1814. He defeated the Creeks of Ala. in several engagements 1813–14, the British at New Orleans Jan. 8, 1815, thereby winning much fame, and the Seminoles of Fla. 1817–18. He was a Presidential candidate 1824, and was elected 1828 and 1832. The most notable events of his administration were the triumph of the Spoils System, cabinet and social quarrels, his free use of the veto, suppression of the S. C. nullifiers 1832–33, and destruction of the U. S. Bank by withdrawal of the deposits 1833. J. was honest, stubborn, and arbitrary; these qualities, with his democratic simplicity, made him the most popular party leader of his time. His character and measures, especially as to the bank, occasioned violent controversy, and are still variously judged.

**Jackson,** CHARLES, LL.D., 1775–1855. Judge of Mass. Supreme Ct. 1813–24. *Pleadings and Practice in Real Actions*, 1828.

**Jackson,** CHARLES THOMAS, M.D., 1805–1880. State Geologist of Me. 1836 and of R. I. 1839; geological surveyor of N. H. 1841–44, and of the mineral lands of Mich. 1847–49; claimant of the invention of the telegraph 1834; author of many scientific papers and discoveries; involved in controversies which in 1873 unhinged his mind. See ETHER.

**Jackson,** GEORGE THOMAS, M.D., b. 1852. Prof. of Dermatology in Woman's Medical Coll., New York, 1890. *Diseases of the Skin*, 1892.

**Jackson,** MRS. HELEN. See HUNT, HELEN M.

**Jackson,** HENRY ROOTES, b. 1820. Judge Ga. Superior Ct. 1849–53; U. S. Minister to Austria 1854–58, and to Mexico 1865; Gen. C. S. A. 1861–65.—His uncle, JAMES, 1757–1806, was a revolutionary officer, M.C. 1789–91, U. S. Senator 1793–95, and from 1801, and Gov. of Ga. 1798–1801.—His grandson, JAMES, 1819–1887, was Judge of Ga. Superior Court 1846–59 and 1875–79, Chief-justice from 1879, and M.C. 1859–61.

**Jackson,** HOWELL EDMONDS, b. 1832 in Tenn. U. S. Senator 1881–86; U. S. Circuit Court Judge 1886–93; Associate Justice U. S. Supreme Court 1893.

**Jackson,** THOMAS JONATHAN, 1824–1863. Prof. Va. Military Institute 1851; Major-gen. C. S. A. 1861. He gained his sobriquet of Stonewall at the first battle of Bull Run by strenuously holding an exposed position; commanded a corps at Gaines's Mill, and at Malvern Hill; took Harper's Ferry Sept. 15, 1862; fought at Antietam and Fredericksburg; became Lieut.-gen. Dec. 1862, and was mortally wounded by shots from his own troops at Chancellorsville, May 2, 1863, when returning from a reconnaissance.

**Jackson,** WILLIAM, 1730–1803. Organist of Exeter cathedral from 1777; composer of songs and operas; musical critic.

**Jackson,** WILLIAM, 1759–1828. Aid and sec. to Washington; Sec. U. S. Constitutional Convention 1787; surveyor of Phila. 1796–1801; ed. *Register*, 1802–15.

**Jacksonville.** Capital of Duval co., Fla., on the St. John's R., 23 m. above its mouth. Pop., 1890, 17,201, increased in winter by many Northern visitors.

**Jacksonville.** Capital of Morgan co., Ill., 90 m. n. e. of St. Louis. Pop., 1890, 12,935.

**Jackstones.** Child's game of tossing and catching stones or other small objects, practically universal in Europe and Asia; dating from remote antiquity. In Korea it is played by boys, while girls have a similar game with coins, which are tossed upon a pillow. The successive throws receive names in Asia, as with English and American children; a common game in Korea is called "laying, setting, and hatching the eggs."

**Jackstraws.** Game which consists in picking up or tossing aside one by one, without disturbing the others, a handful of small splints, often made in a variety of forms. Its origin is unknown. It is regarded by some as an importation from China, where children play a similar game with the ends of burned incense sticks, under the name of INCENSE DISTINGUISHING (q.v.). The bone and ivory jackstraws which come from China are made at Canton for export.

**Jacob.** Son of Isaac and Rebekah, grandson of Abraham, and under his name of Israel, ancestor of the Twelve Tribes.

Jacob Watering his Flock, by Salvator Rosa.

**Jacob** OF EDESSA, d. 708. Bp. 687–88; Syriac translator of many Greek books.

**Jacob** OF HUNGARY, d. ab. 1252. Leader of a mob of pretended crusaders, who committed many outrages in France.

**Jacob,** P. L. See LACROIX, PAUL.

**Jacobean.** Important determinant in the theory of elimination. It is based upon n functions, each of n variables, and each of its elements is a partial derivative of a function in reference to one of its variables. Each row comprises the partial derivatives of one function in reference to its n variables, and each column the derivatives of the n functions in reference to one variable.

**Jacobi,** ABRAHAM, M.D., b. 1830 in Germany. Prof. in New York from 1860; medical writer. *Therapeutics of Infancy*, 1889.—His wife, MARY PUTNAM, M.D., b. 1842, m. 1873, is a pioneer of feminine practice, long prof. in New York, and author of medical works.

**Jacobi,** FRIEDRICH HEINRICH, 1743–1819. German philosopher, opponent of the systems of Spinoza and Kant; pres. Munich Academy of Sciences 1807–13. He founded all knowledge upon faith or belief as opposed to reason, anticipating Hamilton, espousing Common Sense, and making the function of understanding purely logical or elaborative. *Breife über die Lehre Spinoza's.* He pub. two novels, *Waldemar*, 1779, and *Allwill*, 1781.

**Jacobi,** HERMANN GEORGE JACOB, b. 1850. Prof. of Sanskrit at Kiel 1885, and Bonn 1889; writer on the sacred books of India.

**Jacobi,** JOHN CHRISTIAN, 1670–1750. English translator of German hymns. His *Psalmodia Germanica*, 1722–25, was enlarged by John Haberkorn 1765. Several of his versions have been widely used.

**Jacobi,** KARL GUSTAV JACOB, 1804–1851. Prof. of Mathematics at Königsberg 1829. Besides his principal work, *Theory of Elliptic Functions*, 1829, he pub. important Memoirs on

Determinants, Differential Equations, the Theory of Numbers, and Dynamics. He first formed the determinant called from him the Jacobean.

**Jacobinism.** Principles of the Jacobins; factious opposition to orderly government; so called from a society of agitators, who in 1789 met in the Jacobin Convent in Paris. The more violent members soon gained control, and presided in the Reign of Terror.

**Jacobins.** See JACOBINISM.

**Jacobi's Law.** When an electric motor does its greatest possible work, it diminishes the original current one-half, and hence under these conditions a loss of 50 per cent is experienced. It is sometimes called the law of Maximum Work.

**Jacobite Church.** Syrian Monophysites, disciples of Jacob Baradaeus; Bp. of Edessa 541–578. They spread eastward, have a patriarch on the Tigris, and are supposed to be most numerous in w. India.

**Jacobites.** Partisans of the descendants of James II. of England, in exile from 1688. They rose 1715 and 1745, in vain

Caricature against the Jacobites.
From *Read's Weekly Journal*, 1718.

attempts to restore the Stuart dynasty. They were Catholics, Highchurchmen and Tories, and the Irish.

**Jacobs,** CHRISTIAN FRIEDRICH WILHELM, 1764–1847. German classical scholar, ed. *Anthologia Græca*, 13 vols., 1794–1814.

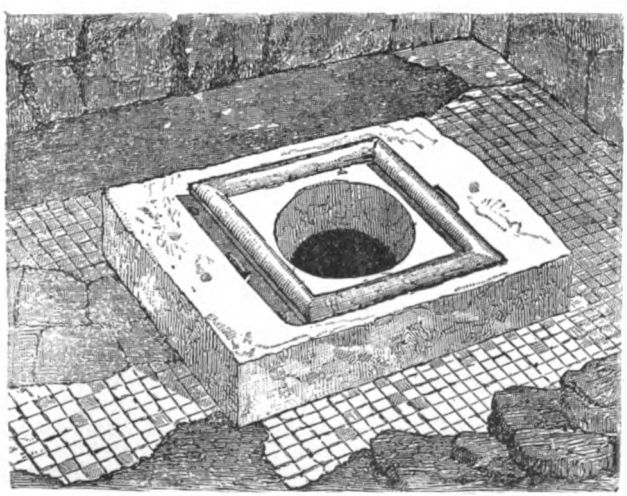
**Jacobs,** HENRY EYSTER, D.D., b. 1844. Prof. at Gettysburg, Pa., 1870, Phila. Theol. Sem. 1883; Lutheran writer and translator.—His father, MICHAEL, D.D., 1808–1871, was prof. at Gettysburg from 1832.

**Jacobsen,** JENS PETER, 1847–1885. Danish realistic novelist.

**Jacob's Ladder.** *Polemonium cœruleum.* Blue-flowered herb of the Phlox family, native of n. Europe, cultivated for ornament.

**Jacob's Staff.** Rude stick, shod with an iron shoe, used to support a surveyor's compass when a tripod is not at hand.

**Jacob's Well.** Still extant near Shechem; supposed scene



Jacob's Well, near Nabulus, Palestine.

of the interview between Christ and the Samaritan woman, John iv. Visited very much by tourists.

**Jacobus.** English gold coin, minted 1603–25; value 25 shillings, or ab. $6.

**Jacobus,** MELANCTHON WILLIAMS, D.D., LL.D., 1816–1876. Prof. at Allegheny, Pa., 1851; N. T. commentator.

**Jacobus de Benedictis.** See JACOPONE DA TODI.

**Jacobus de Voragine,** 1230–1298. Italian Dominican, Abp. of Genoa 1292. His lives of the saints, or *Golden Legend*, were very popular. He wrote also a history of Genoa.

**Jacoby,** JOHANN, 1805–1877. German liberal publicist and agitator, tried for treason 1841 and 1849, imprisoned 1866 and 1870.

**Jacoby,** LUDWIG SIGISMUND, 1813–1874. Methodist missionary in Germany 1849–71; in the U. S. 1839–49 and from 1871.

**Jacopo dei Barbari,** ab.1450–ab.1515. Venetian engraver.

**Jacopo della Quercia,** 1350–1438. Italian sculptor.

**Jacopone da Todi,** or JACOBUS DE BENEDICTIS, ab. 1230–1306. Italian poet, Franciscan monk 1268; author of the hymn *Stabat Mater*.

**Jacotot,** JEAN JOSEPH, 1770–1840. Prof. at Dijon 1796 and Louvain 1818; educational reformer. His system was based on the pupil's will and effort, and resembled in some respects those of James Hamilton, Herbart, and Ollendorff. *Enseignment universelle*, 1823; *Mathematiques*, 1828.

**Jacquard,** JOSEPH MARIE, 1752–1834. French inventor. His loom, bought 1806 by the government, revolutionized weaving, and was of especial value in his native city, Lyons. See LOOM.

**Jacquard Loom.** See LOOM.

**Jacque,** CHARLES ÉMILE, b. 1813. French animal and landscape painter.

**Jacqueline,** 1400–1436. Daughter of William VI. of Bavaria; Countess of Holland and Hainault 1417; married to John of Brabant 1418, and to Humphrey of Gloucester 1423; oppressed by the Duke of Burgundy, who claimed and seized her large estates; noted for virtues and misfortunes.

**Jacquemart,** ALFRED HENRI MARIE, 1824–1895. French sculptor.

**Jacquemart,** JULES FERDINAND, 1837–1880. French etcher of still-life, unrivaled in his special line. His landscape work calls for no particular mention, but in fine porcelain, jade, crystal, or the higher grades of the goldsmiths' products, his imitations are in many ways more precious than the originals. Some of his finest work is in the books of his father, ALBERT, 1808–1875, especially *History of Porcelain*, 1861, and in his own series of *Gems and Jewels of the Crown*.

**Jacquemont,** VICTOR, 1801–1832. French traveler in Asia.

**Jacquerie.** Insurrection of French peasants, May 1358. After many crimes, they were defeated June 9 near Meaux.

**Jacquin,** NICOLAS JOSEPH, BARON VON, 1727–1817. Prof. of Chemistry and Botany at Vienna. *Selectarum stirpium americanum historia*, 1763; *Floræ Austriacæ*, 1773–78; *Collectanea ad botanicam, chemiam, et historiam naturalem spectantia*, 1786–96.

**Jadassohn,** SALOMON, b. 1831. German musician, prof. at the Conservatory, Leipsic. *Harmonielehre*, 1883; *Kontrapunkt*, 1884; *Kanon und Fuge*, 1884; *Die Formen in den Werken der Tonkunst*, 1889; *Lehrbuch der Instrumentation*, 1889.

**Jaddua.** Jewish Highpriest under Darius Codomannus and Alexander the Great, who, according to Jewish legend, appeared to Alexander, first in vision, then in solemn procession near Jerusalem, and foretold his victories.

**Jade,** or JADEITE. $NaAlSi_2O_6$. Hard, tough, transparent or translucent stone, whitish or pale green to olive green, highly prized in China for decorative purposes, and also found among the ornaments of the prehistoric dwellers on the Swiss lakes. Mineralogically, several varieties of amphibole (nephrite), zoisite (saussurite), and other minerals, as well as jade proper, which is an aluminium, sodium silicate, found principally in e. Asia.

**Jægers.** Gulls of genus *Stercorarius*, distinguished by having the two middle tail-feathers much longer than the others. They live on the shores of the northern oceans, feed on lemmings and by robbing fish-catching birds, and nest near fresh water.

**Jaffa,** or JOPPA. Town of Palestine, on the Mediterranean; taken by Crusaders 1099; by Salad 1187; recovered by Richard 1191; retaken by Malek el Adil 1196; stormed March 13, 1799, by

Bonaparte, who butchered here 1,200 Turkish prisoners. It is the port of Jerusalem, 33 miles n.w., to which a railroad

Jaffa.

was completed 1892. Pop. ab. 17,000. Here St. Peter saw the vision which led to the reception of the Gentiles into the Church.

**Jagellons.** Polish dynasty 1386–1668; founded by Jagiello, grandduke of Lithuania, b. ab. 1354, son-in-law and successor 1386 of Louis the Great, King of Poland and Hungary. The male line became extinct 1572.

**Jaggernaut.** See JUGGERNAUT.

**Jagic,** VATROSLAV, b. 1838. Croatian philologist, prof. Berlin 1874.

**Jag Spike.** Spike whose edges are notched or jagged to increase its holding power.

**Jaguar.** *Felis onca.* Largest of American FELIDÆ (q.v.). It ranges from Texas to Patagonia, and is 4 to 6 ft. long. The ground color ranges from white through tawny to black, on which are close-set angular rosettes of black spots. This leopard-like tiger-cat inhabits the forests and preys on tapirs, peccaries, cattle, and even on man.

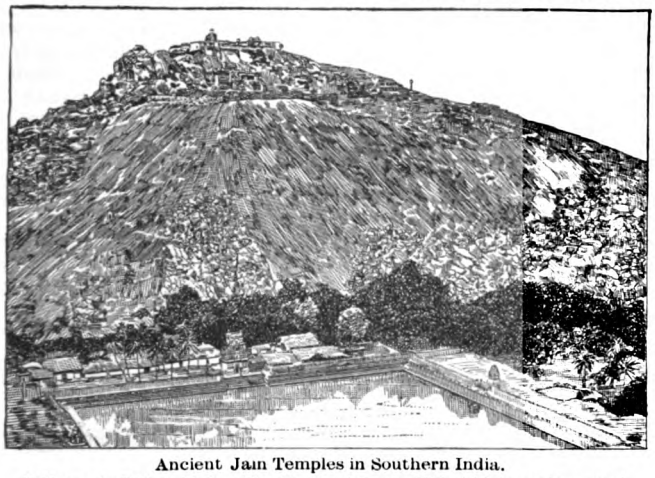
**Jahn,** FRIEDRICH LUDWIG ("TURNVATER"), 1778–1852. German patriot and popularizer of gymnastics, imprisoned 1819–25. *Runenblätter*, 1814–28. His statue was raised near Berlin 1872.

**Jahn,** JOHANN, 1750–1816. Prof. Vienna 1789–1805. *Biblical Archæology*, tr. 1823.

**Jahn,** OTTO, 1813–1869. Prof. Greiswald 1842, Leipzig 1847–51, and Bonn 1855; biographer of Mozart, 1856–60, and writer on the classics, on ancient art, and on music.

**Jail Fever.** Typhus fever.

**Jainism.** Religion of India akin to Buddhism, with which its dogmas in many respects agree. Its foundation is attributed to Pàrcvanâtha, 9th century B.C. The rôle which the



Ancient Jain Temples in Southern India.
Hill nearly 500 feet high, with a Rock-cut Image, 70 feet high, on the summit.

Buddhas play in Buddhism is attributed among the Jains to the Tirthankaras Jinas, "Sages who have stepped beyond the world." The sacred books are very numerous, the principal ones being the 11 Angas.

**Jaipur.** See JEYPORE.

**Jakutsk.** See YAKUTSK.

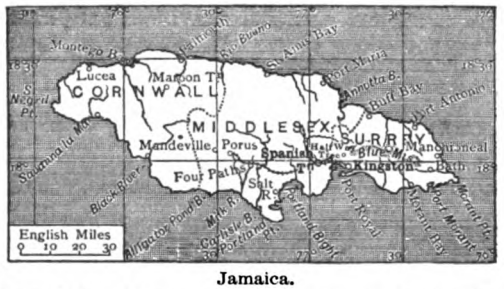
**Jal,** AUGUSTE, 1795–1873. French writer on art, archæology, and biography.

**Jalalabad.** Afghan town, 90 m. e. of Cabul; scene of a British victory 1842. Pop. below 10,000.

**Jalandhar,** or JULLUNDER. Ancient city of the Punjab, n.w. India, 80 m. e. of Lahore. Pop., 1891, 66,202.

**Jalap.** *Ipomœa purga.* Plant of the natural order *Convolvulaceæ*, native of Mexico. The root is used in medicine and is an active cathartic.

**Jamaica.** One of the W. India Islands, s. of Cuba; length 144 m., area 4,200 m.; discovered by Columbus May 4, 1494; colonized 1509; under Spanish rule until 1655, when it was captured by the British. It was long the resort of the buccaneers, who were suppressed ab. 1670. A war between slaves and




Jamaica.

whites lasted 1715–38; another revolt occurred 1795. The slaves were freed 1834 by purchase of the British government. It has suffered much from earthquakes. The negroes rose 1865, but were put down by Gov. Eyre. Pop., 1891, 639,431, of whom but 14,692 were whites.

**Jamaica.** Capital of Queens co., N.Y.; e. of Brooklyn. Pop., 1890, 14,441.

**Jamb.** Angle formed by the upright frame of a door, window or other opening; also face of the opening.

**Jamb Shaft.** In Mediæval Architecture, column into which the jamb of an opening is modeled. The column is often completely developed, with capital and base, but is not an independent member, being merely a modeling of the angle of the wall, although the shafts are sometimes insertions of more costly material, as polished granite or marble.

**James,** "THE ELDER." Son of Zebedee and Salome; one of the three leading Apostles; beheaded 44 by Herod.

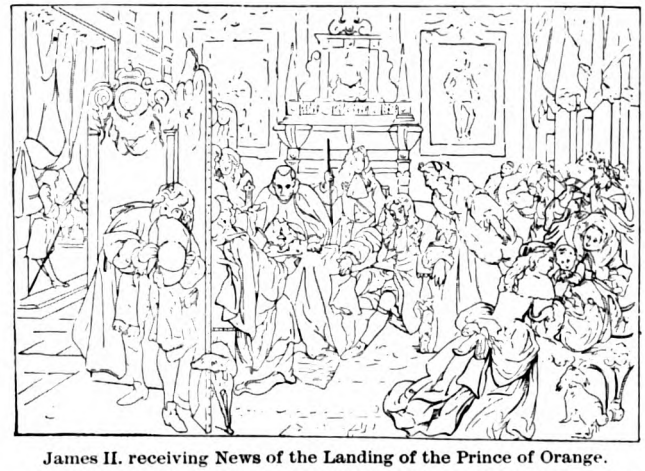
**James,** "THE LESS." Son of Alphæus; probably "the Lord's brother"; one of the Twelve Apostles; Bp. of Jerusalem, called "the Just"; probable author of the Epistle; martyred ab. 68.

**James,** EPISTLE OF. Twentieth N. T. book, ab. 65. It has a peculiar tone of authority, and is practical rather than doctrinal.

**James I.,** OF SCOTLAND, 1394–1437. Son of Robert III.; crowned 1424. While a prisoner in England, 1405–24, he wrote *The King's Quhair* and other poems.—His successors, JAMES II., 1430–1460, III., 1452–1488, IV., 1472–1513, and V., 1512–1542, were involved in wars with England and with their own nobles; all but the last met violent deaths.

**James I.,** OF ENGLAND, 1566–1625. Son of Mary Stuart and Darnley; King of Scotland 1567, and of Great Britain; a petty author and a despicable character. In his reign, politically feeble and disastrous, the English Bible was completed 1611, Virginia and New England were colonized, and the struggle between King and Commons began. *Dæmonologie*, 1597; *Counterblast to Tobacco*, 1616.

**James II.,** 1633–1701. King of England 1685–88; son of Charles I. He exasperated the people by his arbitrary attempts against constitutional government and the reformed religion,



James II. receiving News of the Landing of the Prince of Orange.

and was forced to yield the throne to William and Mary; fled to France; invaded Ireland; was defeated at the Boyne July 1, 1690; and retired to St. Germains, France.

**James,** EDMUND JANES, Ph.D., b. 1855. Prof. Public Finance and Administration in Univ. Pa. 1883; Univ. Chicago 1896; writer on political economy.

**James,** GEORGE PAYNE RAINSFORD, 1801–1860. English historical romancer. *Richelieu*, 1825; *Darnley*, 1830; *Henry Masterton*, 1832. A few of his 77 works are biographical, as *Louis XIV.*, 1838.

**James,** SIR HENRY, F.R.S., 1803–1877. English engineer and geologist; knighted 1860; Major-gen. 1868. He pub. surveys of Ireland, 1858, and Great Britain, 1861–64.

**James,** SIR HENRY, b. 1828. M.P. 1869; knighted 1873; Attorney-gen. 1873 and 1880; Liberal Unionist 1886.

**James,** HENRY, b. 1843. American novelist and critic, long resident abroad; noted for subtile observation, delicate portraiture, and exquisite style. *Roderick Hudson*, 1875; *The American*, 1877; *Daisy Miller*, 1878; *The Europeans*, 1878; *Portrait of a Lady*, 1881; *Princess Casamassima*, 1886; *Tragic Muse*, 1890.—His father, HENRY, 1811–1882, wrote *The Secret of Swedenborg*, 1869, and other philosophical and theological works; his brother, WILLIAM, M.D., b. 1842, prof. Harvard since 1880, has pub. two text-books of *Psychology*, 1890–92.

**James,** JOHN ANGELL, D.D., 1785–1859. Cong. pastor at Birmingham from 1805. *Anxious Enquirer*, 1834.

**James,** ROBERT, 1703–1776. English compounder of antimonial fever powder, and of a *Medical Dictionary*, 1743–45.

**James,** THOMAS. English seaman who, seeking a n.w. passage, explored Hudson's Bay 1631. *Voyage*, 1633.

**James,** THOMAS LEMUEL, LL.D., b. 1831. Deputy collector of New York 1870; Postmaster 1873–80; eminent for his reforms of the service; U. S. Postmaster-gen. 1881–82.

**James,** URIAH PIERSON, 1811–1889. Writer on the Paleontology of Cincinnati.

**James Bay.** S. arm of Hudson's Bay.

**Jameson,** MRS. ANNA (MURPHY), 1794–1860. Irish art-historian and essayist. *Diary of an Ennuyée*, 1826; *Loves of the Poets*, 1829; *Sacred and Legendary Art*, 1848; *Legends of the Madonna*, 1852.

**Jameson,** JOHN ALEXANDER, LL.D., b. 1824. Judge Superior Court of Chicago 1865–83. *Constitutional Convention*, 1867.

**Jameson,** ROBERT, 1772–1854. Prof. of Natural History at Edinburgh 1804; ed. *Edinburgh Philosophical Journal* from 1819. *System of Mineralogy*, 3 vols., 1804–8.

**Jamesone,** GEORGE, ab. 1588–1644. Scottish portrait painter.

**Jamesonite.** $Pb_2Sb_2S_5$. Antimony-lead sulphide, sometimes called gray antimony, feather ore, and tinder ore; found in Cornwall and in the Hartz Mts.

**James River.** In Va. It heads in the Appalachian Valley, w. of the Blue Ridge, flows generally e., and empties into the lower part of Chesapeake Bay. It is navigable to Richmond. Length 450 m., drainage area 9,684 sq. m.

**James** (or DAKOTA) **River.** In S. Dakota; branch of the Missouri, entering it at Yankton; not navigable. Length 415 m., drainage area 22,000 sq. m.

**James River** AND **Kanawha Canal.** Projected waterway from the Ohio R. at its junction with the Kanawha to Chesapeake Bay, making use of the James R. from Richmond to the sea. See CANALS.

**Jamestown.** City of Chautauqua co., N.Y. Pop., 1890, 16,038.

**Jamestown.** In s.e. Va.; first permanent English settlement, made May, 1607, by 105 colonists. The town was destroyed in Bacon's rebellion 1676. Here an action occurred July 6, 1781, between Cornwallis's troops and the Americans.

**Jamestown Weed,** or STRAMONIUM. *Datura stramonium.* Large-flowered plant of the Potato family, native of tropical countries, widely diffused as weeds. Known also as Thorn-Apple, from its spiny fruits. See DATURA.

**Jami,** NUR-UDDIN ABDUR RAHMAN, 1414–1492. Persian poet. His numerous works are mystical, satirical, and romantic.

**Jamieson,** JOHN, D.D., 1759–1838. Pastor at Edinburgh 1797; author of a Scottish Dictionary, 1808–25.

**Jamin's Compensator.** See BABINET'S COMPENSATOR.

**Jamot,** R. E. See THOMAYER, JOSEF.

**Jamyn,** AMADIS, ab. 1530–1593. French poet, translator of Homer 1574.

**Janauschek,** FRANCESCA ROMANA MAGDALENA, b. 1830 in Prague. Tragic actress, well known in the U. S. since 1867.

**Janda,** BOHUMIL, 1831–1875. Bohemian poet and novelist.

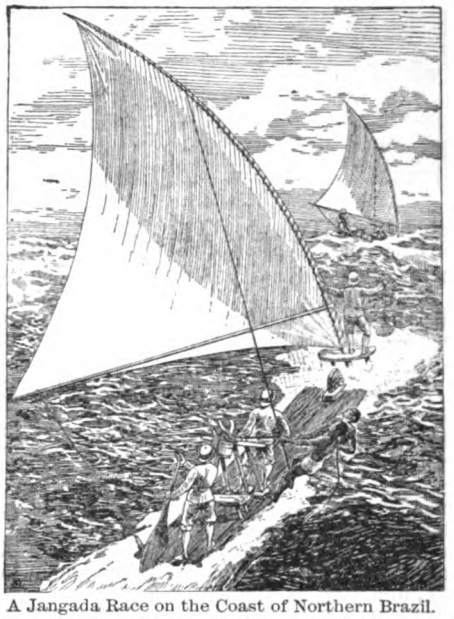
**Janes,** EDMUND STORER, D.D., 1807–1876. M. E. Bp. 1844.

**Janesville.** Capital of Rock co., Wis., 91 m. n.w. of Chicago; founded 1836. Pop., 1890, 10,836.

**Janet,** PAUL, b. 1823. Prof. in the Sorbonne, Paris, 1864; writer on philosophy and ethics. *Final Causes*, tr. 1876; *Elements of Morals*, tr. 1884.

**Janet.** Family of Painters. See CLOUET, JEAN.

**Jangada.** Raft or catamaran used in Peru and Brazil, made of logs lashed together and triangular sails fastened to long whippy masts. The natives balance their craft through



A Jangada Race on the Coast of Northern Brazil.

the rolling surf by hanging on to the ropes and leaning to the windward side, indifferent to the waves which frequently dash clear over their raft.

**Janiculum.** One of the Seven Hills of Rome, w. of the Tiber and s. of St. Peter's.

**Janin,** JULES GABRIEL, 1804–1874. French journalist and novelist, noted chiefly as a critic, and rather brilliant than solid or consistent. Tr. Horace. *Beranger*, 1864; *Lamartine*, 1869.

**Janizaries,** or JANISSARIES. Bodyguard of the Turkish sultan, organized 1329 from Christian captives compelled to embrace Mohammedanism. In the 17th century they numbered ab. 100,000; extraordinary privileges were granted them, and for a time they were masters of the Empire, having deposed four and caused the death of five sultans. In June 1826 they rose in insurrection and were defeated in a terrible 3 days' struggle, 20,000 being slain, 20,000 more banished soon after, and the corps abolished by a firman.

**Jan Mayen Land.** Island in Arctic Ocean, lat. 70° 29′ N., long. 7° 31′ W.; 35 m. long; discovered 1611.

**Janney,** SAMUEL MACPHERSON, 1801–1880. American biographer of Penn and Fox, 1852–53. *Hist. Society of Friends*, 4 vols., 1860–67.

**Janoro,** MATTHIAS VON, d. 1394. Bohemian reformer, forerunner of Huss. His doctrines were condemned 1410 by the Pope, and his writings burned with those of Wiclif.

**Jans,** or **Jansen,** ANNEKE, ab. 1600–1663. Owner of 62 acres on New York island, which have been the cause of much litigation. Trinity Ch. now holds it.

**Jansen,** CORNELIUS, 1585–1638. Prof. at Louvain 1630, Bp. of Ypres 1636; founder of Jansenism. *Mars Gallicus*, 1635; *Augustinus*, 4 vols., 1640.

**Jansen,** OLAÜS, 1714–1778. Naturalist; prof. Tübingen; under the auspices of the Danish Government traveled in S. and Central America and s. U. S. 1764–72.

**Jansenism.** Movement in R. C. Ch., beginning 1640, distinguished by strict Augustinian doctrine, deep piety, and austere and lofty morality; intensely hostile to the Jesuits; finally condemned 1713.

**Janson,** KRISTOFER, b. 1841. Norwegian novelist and poet, pastor in Minnesota 1882.

**Janssen,** CORNELIS, 1590–1665. Dutch painter, long in England.

**Janssen,** JOHANNES, Ph.D., 1829–1891. German R. C. historian. His *German People from End of Middle Ages* (to 1618), 6 vols., 1876–85, caused much controversy.

**Janssen,** PIERRE JULES CÉSAR, b. 1824. French astronomer, founder 1893 of the observatory on Mt. Blanc.

**Janssens,** ABRAHAM, ab. 1570–1632. Dutch painter.

**Janssens,** VICTOR HONORIUS, 1664–1739. Flemish painter.

**Janthina.** See PTENOGLOSSA.

**Januarius,** ST., d. 305. Bp. of Benevento, martyr, and patron of Naples. The annual liquefaction of his blood, on his day, Sept. 19, is a local prodigy.

**January.** In the calendar of Numa, and later of Gregory, the first month of the year. Originally of 29 days, Julius Cæsar added 2. Its position as first month was fixed in England by act of Parliament 1751.

**Janus.** Ancient Latin divinity representing the sun, presiding over all beginnings, and opening the year; porter of heaven and keeper of gates; generally double-faced, but sometimes 4-headed as presiding over the seasons. His temple (so-called) at Rome, a mere covered passage, was open in time of war to show that the god had gone to aid the warriors. New Year's Day was his chief festival.

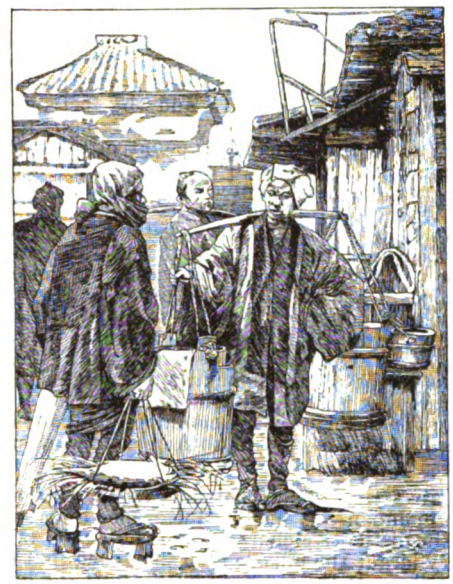
Janus.

**Janvier,** THOMAS ALLIBONE ("IVORY BLACK"), b. 1849. American writer, chiefly on artistic and Mexican subjects. *Color Studies*, 1885; *Mexican Guide*, 1886; *Aztec Treasure-House*, 1890; *Stories of Old and New Spain*, 1891; *An Embassy to Provence*, 1893.—His sister has written much as "Margaret Vandegrift."

**Japan.** Empire of eastern Asia, consisting of a number of islands, four of them of large size; viz., Nippon, Yezo, Kiushiu, and Shikoku. They are separated from the mainland by the Sea of J. Their surface is mountainous in the interior, with extensive plains stretching to the seaboard. Many of the mountains are volcanic and several reach great elevations. The area of the Empire is 157,000 sq. m. Rice, wheat, and other cereals, tea, cotton, sugar, and tobacco are raised. There are extensive native manufactures and some mining, the mineral resources being large. The capital is Tokio.

The Ainos of Yezo are thought to represent the indigenous race, early driven n. by invaders from the s.w., who occupied Kioto and neighboring provinces. The present inhabitants are related both to the Malays and the Chinese. According to tradition, the first Emperor (Mikado) arose 600 B.C. He dwelt at Kioto. All warlike operations were directed by him, or by an imperial prince. The military and agricultural classes were separated 770–780. Rival clans now ruled. That of Minamoto was for a time supreme: its seat was Kamakura in e. Japan. In 1192 Yoritomo, a member of this family, was made Shogun, or generalissimo. Each succeeding Shogun was thus nominated and invested by the Emperor, whom his power soon overshadowed, but who was always regarded with superstitious reverence. 1219–1333 the Hôjô family acted as regents of the Shoguns. Civil wars raged during the 14th and 15th centuries. Kamakura was destroyed 1333. Christianity was introduced by Xavier 1549. The Tokugawa dynasty of Shoguns began 1593 with the investiture of Iyeyasu, and ended 1868. After a great battle, the whole country submitted to Iyeyasu; Jedo became the seat of government, and grew in prosperity and population. A sort of feudal system was introduced. The daimios, or large landed proprietors, resided most of the year on their estates, but their families were retained as hostages at Jedo. The Mikado's court at Kioto was poor and mean in comparison with that of the Shogun, though the ancient nobility who gathered there were superior in rank and prestige. Peace now reigned for more than 250 years. The population was divided into the military (Samurai), agricultural, artisan, and trading classes. Christianity was proscribed 1605; the Jesuits were expelled; ab. 30,000 Christian peasants were massacred 1637. J. was soon closed to the world by severe regulations, made effectual through a system of espionage: the inhabitants could not leave its shores without express permission. But reaction against military rule at last set in. The revolution of 1868 was the result, when the Shogun resigned. In 1869 the name of Jedo was changed to Tokio, and the Mikado removed thither. The daimios voluntarily laid down their dignity.

Previous to the edict forbidding foreign travel, the Japanese had some intercourse with neighboring countries. In 201 the Empress Jiugo invaded Corea, and imported Corean customs into J. A Mongol invasion on the coast of Kiushiu was repelled 1281. The Portuguese visited J. 1542; commercial relations with them continued till 1639. From 1610 the Dutch had almost a monopoly of Japanese trade, but were confined to their factory at Nagasaki. In 1854 Commodore Perry entered the harbor with an American fleet and obtained a commercial treaty from the Shogun, the first of a series of treaties with various nations, which have opened J. to the world. Since then changes, political, educational, and religious, have been rapid, and J. seems destined to take a permanent place among civilized nations. Russia has however secured great influence in Corea and J. may eventually lose Formosa and any permanent advantage.

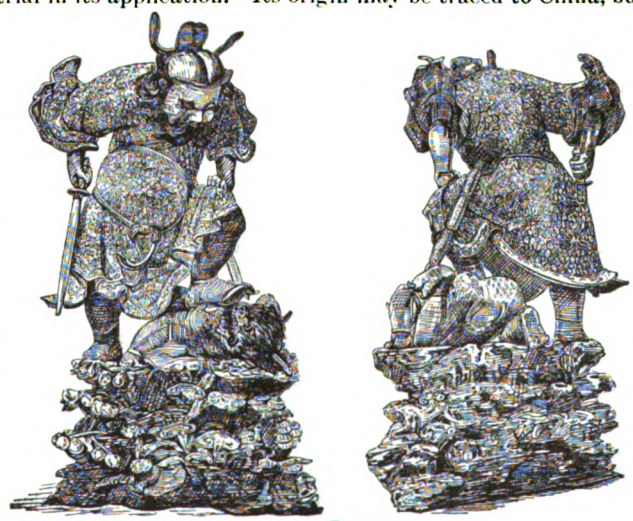


Street Scene in Tokio.

The war with China, 1895, resulted in the conquest of Corea, the complete overthrow of the Chinese navy, and the annexation of Formosa to the Japanese Empire. Pop., 1891, 40,718,677.

**Japan Clover.** See LESPEDEZA.

**Japanese Art.** Essentially decorative, and largely industrial in its application. Its origin may be traced to China, but a distinct development has occurred far transcending that of China, while the Chinese influence has been constantly present.



Japanese Bronze.

Its themes are drawn directly from nature, the selection being influenced by poetry and tradition; from native and Chinese history, and above all from Buddhism, whose priesthood contributed many of the most famous artists of the past. The range of the art products of Japan is extremely varied, in painting, sculpture, pottery, and metal work. These have all attained a perfection unequaled in many respects by any other nation in ancient or modern times.

**Japanese Language.** Agglutinative language, greatly influenced by Chinese. This influence is particularly strong in Japanese literature. Vowels are plentiful in proportion to consonants; but the rigidity of syntax and the general lack of freedom which characterizes all agglutinative languages weigh heavily upon the speech of this ambitious and aggressive race.

**Japanese Music.** This has many points of similarity, practically amounting to identity, with the music of China. History and tradition, as well as the relics of ancient music, the character of its practitioners, and the instruments, indicate that Japan drew its musical culture originally from China, though a Japanese mythological account of its origin exists. Unlike China, Japan has opened its gates to the Western art. In 1878 the government appointed a commission to inquire into European music with reference to its adoption in the public schools. An Institute of Music was established in connection with the Tokio Normal School, and in 1880 an American teacher, L. W. Mason, was engaged as Instructor of Music. He remained two years, and was succeeded by a German, who undertook to fit the school songs with harmonies for string instruments. The policy of the school was "to secure new and suitable music . . . by selecting the best from both European and Oriental music." While the popular music retains its old characteristics, the new is strongly influenced by Western melody. In fact, our popular melodies are common in Japan; in the war with China, 1895, the melody of an American war song was set to a Japanese hymn.

**Japanese Pug.** Small, pet dog, rather rare and highly prized even in Japan. It has been degraded by breeding until it has lost the distinctive characters of the genus *Canis*. The eyes are very large; the muzzle is so shortened that often only 16 teeth are present: the forehead bulges out; the hair is long, and the color is black and white.

**Japanning.** Art of giving a hard coating of varnish, generally black or brown, but sometimes of light colors, to metal, wood, or papier-maché surfaces, so called from its resemblance to Japanese lacquer work. The chief constituent of black japan, most commonly used for this purpose, is asphaltum.

**Japan Sea.** Part of the Pacific, separating the islands of Japan from the mainland.

**Japheth.** Son of Noah; ancestor of the Turanian and European races. How far these genealogical traditions, confessedly of great value, are absolutely accordant with later ethnological results, is variously debated among scholars.

**Japhetic Languages.** Name sometimes given to the Aryan or Indo-European tongues as parallel with Semitic and Hamitic.

**Japura,** YAPURA, or CAQUETA. Tributary of the Amazon, rising in s. Colombia. Length ab. 1,000 miles.

**Jar.** Sliding joint, used in sinking artesian or oil wells, that allows the cutting chisel, or lower member of the string of tools, to fall independently of the rest of the apparatus. It is made in several forms.

**Jardine,** ROBERT, b. 1840. Canadian educator. *Psychology of Cognition*, 1874.

**Jardine,** SIR WILLIAM, 1800-1874. Scottish naturalist. *Ornithology*, 1849.

**Jardin des Plantes.** Within ab. 75 acres this promenade of Paris contains museums of natural history, of zoölogy, anatomy, anthropology, botany, mineralogy, and geology. Its courses of scientific lectures render it an institution of learning widely celebrated.

**Jargon.** Yellowish zircon, found in Ceylon, resembling the diamond in luster, but not prized as a gem. Compare HYACINTH.

**Jarnac.** Village of w. France, 20 m. w. of Angoulême. Here, March 13, 1569, the Duke of Anjou defeated the Huguenots under Condé and Coligny. Condé was wounded, and murdered after surrendering.

**Jarochowski,** CASIMIR, b. 1829. Polish historian.

**Jarves,** JAMES JACKSON, 1818–1888. American writer, chiefly on art. *Parisian Sights*, 1853–56; *Confessions of an Inquirer*, 1857–69.

**Jarvis,** ABRAHAM, D.D., 1739–1813. Bp. of Conn. 1797.—His son, SAMUEL FARMER, D.D., LL.D., 1786–1851, was historiographer of the P. E. Ch. from 1838.

**Jarvis,** EDWARD, M.D., 1803–1884. He devoted much time to the study of insanity, the laws of life and health, and vital statistics.

**Jasher,** BOOK OF. Quoted Josh. x. 13 and 2 Sam. i. 18; not extant. At least three books bearing this title were written by Mediæval Jews; that pub. 1751 is a forgery.

**Jasmin,** JACQUES, 1798–1864. Provençal barber and poet of high repute. *Curl-papers*, 1835–53. His *Blind Girl of Castel-Cuillé*, 1836, was tr. by Longfellow.

**Jasmine,** or JESSAMINE. *Jasminium officinale.* Trailing, fragrant, white-flowered shrub of the natural family *Oleaceæ*,

Jasmine (*Jasminium officinale*).

native of s. Asia; often cultivated in hot-houses, as are several other species of the same genus.

**Jason.** Leader of the Argonauts; winner of the Golden Fleece; husband of the sorceress Medea.

**Jason,** d. 370 B.C. Ruler of Pheræ ab. 395 B.C., and later of all Thessaly.

**Jasper.** Opaque, uncrystallized, impure quartz or opal, usually of a red, brown, green, or mixed color, due to the impurities present.

**Jasper,** WILLIAM, ab. 1750–1779. Sergeant in the War of Independence, eminent for reckless valor; killed at Savannah.

**Jassy.** City of Roumania, on a branch of the Pruth; capital of Moldavia from 1565; burned by Turks 1822. It has a small university. Pop., 1890, 72,892.

**Jataka.** Collection of Buddhist legends, edited 1877–87; partly tr. 1880.

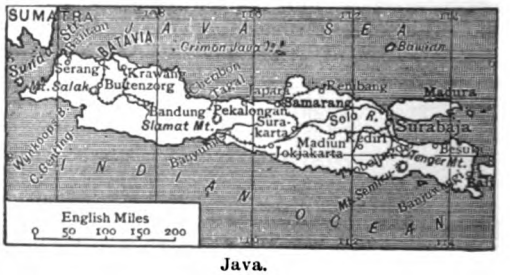
**Jats.** Race of n.w. India, numbering ab. 4,500,000; perhaps descended from the Getæ.

**Jaume Sainte-Hilaire,** JEAN HENRI, 1772–1845. French botanist. *Exposition des familles naturelles et de la germination des plantes*, 1805; *Plantes de la France*, 1805–22; *La Flore et la Pomone francaises*, 1828–33.

**Jaundice.** Yellow discoloration of the skin, mucous membranes and excretions and secretions caused, by the presence in the blood of the coloring matters of the bile. Denominated hepatogenous when due to disease of the liver or obstruction to the flow of bile into the intestines, and hæmatogenous when it occurs during some constitutional disease. Most commonly due to disordered digestion, and often is epidemic in hot climates. Regulation of the diet and cathartics usually effect a cure. See CHOLÆMIA.

**Jauregui,** JUAN DE, ab. 1575–1650. Spanish poet, tr. Tasso's *Aminta*, 1607, and Lucan's *Pharsalia; Orfeo*, 1624.

**Java.** Island in the Indian Ocean, separated from Sumatra by the Strait of Sunda and from Borneo by the Java Sea. Its




Java.

length is 600 m. and its breadth ab. 100. Its area, including the adjacent island of Madeira, is 52,000 sq. m. It is trav-

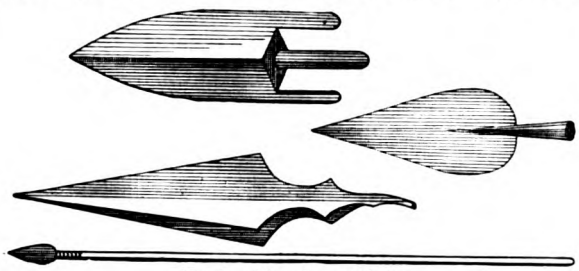
ersed throughout its length, e. and w., by a range of volcanic mountains, reaching a height of ab. 12,300 feet. The Dutch have had settlements on the n. coast since 1596, and control the island. It is divided into 22 residencies, each administered by a resident, who is subordinate to the Gov.-gen. of the Dutch E. Indies, but nevertheless exercises almost absolute authority through European and native inferior officials. Two of these divisions are, however, ruled by dependent princes. The inhabitants are of the Malayan race and are Mohammedans and chiefly agriculturists. Their language belongs to the Malayo-Polynesian group. Pop. ab. 21,000,000.

**Javan.** In O. T., Greeks; properly Ionians, this maritime branch of the Hellenic race being the earliest known to the Orientals.

**Javary,** or YAVARI. Branch of the Amazon, between Peru and Brazil.

**Java Sea.** Part of the Indian Ocean, between Borneo and Java.

**Javelin.** Light lance, ab. 6¾ ft. long, having a wooden shaft and spear-head, sometimes barbed, which could be hurled by the hand; used by the Greeks, Romans, Assyrians, and



Heads of Small Javelins.

Goths. The soldiers of the first and second lines of the Roman legion were each armed with two javelins, one being hurled against the advancing enemy, the other retained for defense against cavalry.

**Javelle Water.** Used for cleansing and bleaching purposes; made by dissolving 4 lbs. washing soda in 1 gallon of water; after boiling for 10 minutes, 1 lb. of chloride of lime, free from lumps, is added. When cool it is filtered and kept in a tightly stoppered bottle.

**Jaw.** There are two, upper and lower, the upper bone separable into two parts, and each is composed of a double shell of bone with a large cavity, called Antrum of Highmore, between. Lower jawbone is horseshoe shaped, caulks upward and forms the joints with the temporal bone. The jawbones contain all the teeth; the lower one only moves.

**Jaxartes,** SIHUN, or SYR-DARIA. River of Turkestan, flowing w. and n. w. to the Aral Sea; navigable for 850 m. Length ab. 1,500 m.; drainage area, 320,000 sq. m.

**Jay,** JAMES, M.D., 1732–1815. Brother of Chief-justice Jay, he was associated with William Smith, D.D., in establishing the College and Academy of Philadelphia (now Univ. of Pa.) and King's College (now Columbia). He was knighted 1763 by George III. *Reflections and Observations on the Gout*, 1772.

**Jay,** JOHN, LL.D., 1745–1829. Delegate to Congress from N.Y. 1774–76 and 1778–79; U. S. Minister to Spain 1780–82; Peace Commissioner at Paris 1782–83; Sec. for Foreign Affairs 1784–89; first Chief-justice of the U. S. 1789; negotiator of a treaty with England 1794; Gov. of N.Y. 1795–1801; contributor to *The Federalist*.—His son and biographer, WILLIAM, LL.D., 1789–1858, was Judge of Westchester co., N.Y., 1818–43, and active against slavery and intemperance.—His son, JOHN, 1817–1894, was Minister to Austria 1869–75.

**Jay,** WILLIAM, D.D., 1769–1853. Cong. pastor at Bath from 1791; noted as a preacher. His *Morning and Evening Exercises*, 4 vols., 1842, and *Mornings with Jesus*, 1854, were very popular. *Works*, 12 vols., 1842–48.

**Jayadeva,** 12th century. Hindu poet. *Gita Govinda*, tr. 1875 as *Song of Songs*.

**Jayhawkers.** Bands organized at first to resist pro-slavery outrages in e. Kansas 1854–59, but assuming in the Civil War a lawless and predatory character.

**Jayme,** JAUME, or JACME I., ab. 1208–1276. King of Aragon; conqueror of several Moorish states; alleged author of a dubious autobiography, pub. 1515–57.—His grandson, JAYME II., ab. 1259–1327, King of Sicily 1285 and of Aragon 1291, was an enlightened and useful ruler.

**Jays.** Brightly colored, noisy birds, near relatives of the Crow; represented by numerous species distributed throughout

Jays (*Cyanocitta cristata*).

the n. hemisphere. They do considerable damage, robbing nests, etc. Genus *Garrulus* is represented in Europe; *Cyanocitta* is American.

**Jazyges.** Sarmatian tribe, who occupied Pannonia ab. 50, fought the Romans, and were subdued by the Goths and Huns.

**Jeaffreson,** JOHN CORDY, b. 1832. English novelist and journalist. *Book About Doctors*, 1860; *Book About Lawyers*, 1866; *Woman in Spite of Herself*, 1871; *Young Squire of the 17th Century*, 1878; *Lady Hamilton and Lord Nelson*, 1887.

**Jeanne d'Albret,** 1528–1572. Sister of Francis I., wife of Anthony of Bourbon, and mother of Henry IV.; Huguenot leader and heroine.

**Jeanne d'Arc.** See JOAN OF ARC.

**Jean Paul.** See RICHTER, J. P.

**Jebb,** JOHN, D.D., 1775–1833. Bp. of Limerick 1823. *Sacred Literature*, 1820; *Practical Theology*, 1830; *Correspondence*, 1834.

**Jebb,** JOHN, D.D., 1805–1886. Canon of Hereford 1870. Writer on the Ch. and its ritual.

**Jebb,** RICHARD CLAVERHOUSE, LL.D., b. 1841. Prof. of Greek at Glasgow 1875, and Cambridge 1889; editor of Sophocles. *Attic Orators; Modern Greece*, 1880; *Bentley*, 1882; *Greek Poetry*, 1893.

**Jebus.** Original name of Jerusalem.

**Jebusites.** One of the Canaanitish tribes put under the ban by the Israelites, and partly exterminated. Their city, Jebus, was conquered by David, who made it his capital. 2 Sam. v. 6.

**Jedburgh.** Town of Roxburghshire, 49 m. s. e. of Edinburgh; noted for its ruined abbey, built 1118–47. Pop., 1891, 3,397.

**Jeer Blocks.** Blocks through which jeers are reeved.

**Jeers.** Ropes by which the lower yards of a vessel are suspended.

**Jefferies,** JOHN RICHARD, 1848–1887. English writer on country life. *Gamekeeper at Home*, 1878; *Wild Life*, 1879; *Story of My Heart*, 1883; *Open Air*, 1885; *After London*, 1885.

**Jefferson,** JOSEPH, b. 1829. American actor, trained for the stage in childhood, and famous since 1865 in the part of Rip Van Winkle. His autobiography, 1890, is one of the best of theatrical memoirs.

**Jefferson,** THOMAS, LL.D., 1743–1826. Third Pres. of the U. S., and leader of the original Republicans as opposed to the Federalists; Delegate to Congress 1775–76; author of the origi-

nal draft of the Declaration of Independence, which was revised by Franklin and Adams; Gov. of Va. 1779–81; sent to Europe 1784 with Franklin and Adams to negotiate treaties of commerce; first Sec. of State 1789–93; Pres. 1801–9. He was a believer in man and in popular government; his administrations

Thomas Jefferson

were marked with the democratic simplicity and disregard of ceremony which accorded with his convictions. The most important act of his term was the purchase of the Louisiana Territory from the French. *Works*, 9 vols., 1853–54; *Memoirs and Correspondence*, 4 vols., 1829.

**Jefferson City.** Capital of Missouri, in Cole co., on the right bank of the Missouri R. Pop., 1890, 6,742.

**Jefferson Medical College.** Founded 1826 in Phila., and ever since one of the leading professional schools of U. S. It received an independent charter 1836. Some of the most eminent physicians and surgeons of America have been on its faculty; its graduates exceed 10,000.

**Jeffersonville.** Capital of Clark co., Ind.; on the Ohio, opposite Louisville, Ky. Pop., 1890, 10,666.

**Jeffrey,** FRANCIS, LORD, 1773–1850. Scottish essayist; ed. *Edinburgh Review*, 1802–29; Lord Advocate and M. P. 1830; Judge 1834.

**Jeffreys,** GEORGE, BARON, 1648–1689. Most infamous of British judges; Recorder of London 1678; Chief-justice 1683; Lord Chancellor and Baron 1685. He abetted the tyranny of James II., sentenced Algernon Sydney, tried and insulted Baxter, and in the "Bloody Assize" of 1685 hanged 320 of Monmouth's soldiers and transported 841; these trials were brutal travesties of justice. He died in the Tower of London.

**Jeffreys,** JOHN GWYN, 1809–1885. English zoölogist, whose exact knowledge of recent forms was of exceptional value in the study of the fossils of the later Tertiary deposits.

**Jehoahaz.** 1. King of Israel 856–840 B.C.; son of Jehu. 2. Shallum, King of Judah 609 B.C.; son of Josiah.

**Jehoiada.** Jewish Highpriest, who destroyed the usurper Athaliah 878 B.C.

**Jehoiakim.** King of Judah 610–599 B.C.; son of Josiah. He rebelled against Babylon, and was overthrown, as predicted by Jeremiah, ch. xxxvi.—His son, JEHOIACHIA, after 3 months' reign, was a captive in Babylon till 562 B.C.

**Jehosaphat.** Fourth successor of Solomon as King of Judah, 914–889 B.C.; succeeded by his son, Jehoram.

**Jehovah.** Sacro-sanct name of Deity, not to be pronounced by the Jews; usually translated "Lord."

**Jehu.** General of Joram, whom he slew, with the whole male posterity of Ahab; King of Israel 883–855 B.C.

**Jehudah,** or **Judah,** BEN SAMUEL, ab. 1080–ab. 1140. Spanish Jew, called also Halevy and Abul Hassan; author of Hebrew poems and an Arabic work, *Al-Chazari*.

**Jejeebhoy,** SIR JAMSETJEE, 1783–1859. Parsee philanthropist of Bombay, knighted 1842; Baronet 1857.

**Jejunum.** Portion of intestine, ab. 8 feet long, which connects duodenum and ileum. See ABDOMEN.

**Jelf,** RICHARD WILLIAM, D.D., 1798–1871. Principal of King's Coll., London, 1844. *Means of Grace*, 1844; *39 Articles Explained*, 1873.

**Jelf,** WILLIAM EDWARD, D.D., 1811–1875. Proctor of Oxford. *Greek Grammar*, 1842; *Faith*, 1857; *Confession*, 1875; *Ritualism*, 1876.

**Jellachich,** JOSEPH, BARON, 1801–1859. Austrian officer; Ban of Croatia 1848; active in suppressing the Hungarian revolt; Count 1855. *Poems*, 1851.

**Jellaleddin,** 1195–1262. Third great Mohammedan poet, chief of the Sufi Sect. His poetry is mystical.

**Jemmapes.** Town in Hainault, Belgium. Here, Nov. 6. 1792, 40,000 French republicans under Dumouriez defeated 19,000 Austrians. Pop., 1891, 11,682.

Battle of Jemmapes.

**Jena.** Town of Saxe-Weimar; seat of a university, founded 1547–58, which had, in 1895, 85 teachers and 667 students; scene of Bonaparte's victory, Oct. 14, 1806, over the Prussians commanded by Prince Hohenlohe. Sixty standards, 300 pieces of artillery, 20 generals, and 20,000 other prisoners were taken. Napoleon advanced to Berlin. Pop., 1890, 13,449. See BERLIN DECREE and AUERSTADT.

**Jenckes,** THOMAS ALLEN, 1818–1875. M.C. from R. I. 1863–71; father of legislation for Civil Service Reform, and of the Bankrupt law of 1867.

**Jenghiz Khan,** 1162–1227. Mongol chief whose kingdom originally lay between the Amur and the Great Wall of China. Beginning his reign at 13, he conquered internal and foreign foes, overran the Empire of North China 1211, annexed Kara Chitai 1217, and devastated Kharezm, even to the Caspian Sea and the Indus, 1218–25. He was a wise ruler and administrator as well as warrior.

**Jenkin,** HENRY CHARLES FLEEMING, 1833–1885. Prof. of Engineering in Univ. Edinburgh 1868; scientific writer. *Papers*, 1887.

**Jenkins,** CHARLES JONES, LL.D., 1805–1883. Judge Ga. Supreme Court 1860–65; Gov. of Ga. 1865–68.

**Jenkins,** JOHN EDWARD, b. 1838 in India. M.P. for Dundee 1874–80. Most of his books, as *Ginx's Baby*, 1870, aim at social or other reforms.

**Jenkins,** THORNTON ALEXANDER, U.S.N., 1811–1893. Captain 1862, Rear Admiral 1870; engaged in the reduction of Port Hudson and Mobile.

**Jenkins Ferry.** In Ark.; scene of an action, April 30, 1864, between Unionists under Steele and Confederates under Kirby Smith.

**Jenks,** JEREMIAH WHIPPLE, b. 1856. Political economist, Prof. of Political, Municipal, and Social Institutions Cornell University, 1891. *Henry C. Carey, als Nationel-ökonom; Road Legislation for the United States.*

**Jenner,** EDWARD, M.D., F.R.S., 1749–1823. Apostle of in-

Dr. Edward Jenner.

oculation. Like every other reform, this met violent opposition, and triumphed only after great difficulties and delays.

**Jenner,** SIR WILLIAM, M.D., F.R.S., b. 1815. Prof. Univ. Coll., London, 1848–79; physician to the queen 1862, Baronet 1868. *Diphtheria*, 1861.

**Jennings,** SARAH. See MARLBOROUGH.

**Jensen,** ADOLF, 1837–1879. German musician, distinguished chiefly as a composer of songs.

**Jensen,** WILHELM, b. 1837. German novelist.

**Jenyns,** SOAME, 1704–1787. English M.P. and official. *Origin of Evil*, 1756; *Internal Evidence of the Christian Religion*, 1776.

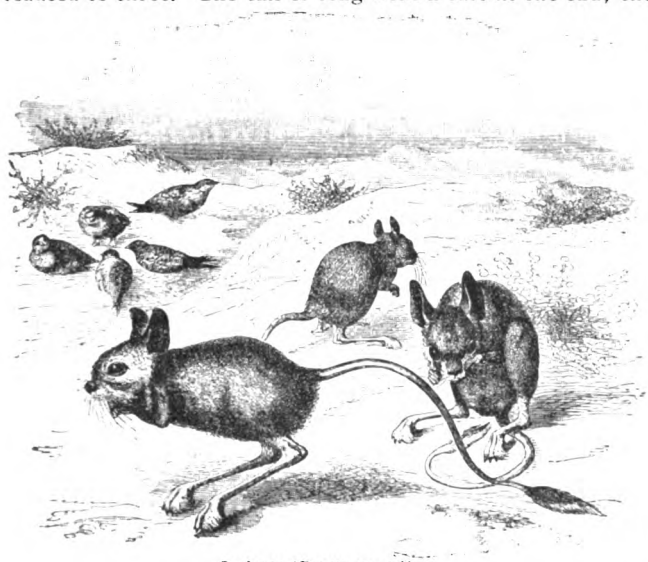
**Jeopardy.** The common law, and, in the U.S., constitutional provisions, protect a person from being put twice in peril for the same offense. A prisoner is in jeopardy as soon as a jury is empaneled and sworn to try his case under a valid indictment and in a court of competent jurisdiction.

**Jephthah.** Ninth Judge of Israel, ab. 1188–1182 B.C. In fulfillment of a rash vow, he sacrificed his daughter, or, as some think, devoted her to celibacy and service of the tabernacle.

**Jerabek,** FRANTISEK, b. 1836. Bohemian dramatist and poet. *Hist. Early Romantic Poetry*, 1883.

**Jerablûs.** See CARCHEMISH, HITTITES.

**Jerboa** (DIPODIDÆ). Family of Rodents, including 22 species of jumping mice, found in s. Europe, Asia, and n. Africa. The front legs are small; the hind legs have the metatarsals united into a long, slender cannon-bone, and toes reduced to three. The tail is long with a tuft at the end; the



Jerboas (*Dipus ægyptius*).

ears are large. They are agile, and progress by long, quick leaps, like a kangaroo. They leave their burrows by night to feed on herbs and grain. *Jaculus hudsonius*, 5 in. long exclusive of tail, is the only American species, but is widely distributed in N. America. See MYOMORPHA.

**Jerdan,** WILLIAM, 1782–1869. Scottish journalist, ed. *London Literary Gazette*, 1817–50; pensioned 1852. *Autobiography*, 4 vols., 1852–53.

**Jeremiah.** Author of the 24th O. T. book, and probably of the 25th. His prophecies, ab. 629–586 B.C., foretold the Captivity of Israel, and its restoration.

**Jeremie,** JAMES AMIRAUX, D.D., 1800–1872. Prof. Haileybury 1831–49; prof. Cambridge 1849–70; Dean of Lincoln 1864; writer on Ch. history.

**Jerez,** or XERES. City of s. Spain, near the river Guadelette, 14 m. n. e. of Cadiz; held by the Moors till 1255. Pop. ab. 62,000.

**Jerichau,** JENS ADOLF, 1816–1883. Danish sculptor.—His wife, ANNE MARIE ELISABETH (BAUMANN), 1819–1881, and son, HARALD ADOLF, 1852–1878, were noted painters.

**Jericho.** City taken by Joshua, and twice rebuilt on different sites, e. of Jerusalem, in a region once fertile, now desolate.

**Jericho,** ROSE OF. *Anastatica hierochuntica*. One of the *Cruciferæ*, found in the deserts of Egypt.

**Jerked-Beef.** Sun-dried beef. Of Chinese origin, it is more properly called Charqui.

**Jeroboam.** 1. Son of Nebat, of the tribe of Ephraim. When the Ten Tribes revolted (see REHOBOAM) he became King of Israel, and reigned 975–953 B.C. 2. Fourteenth King of Israel 825–784 B.C.; a conqueror and idolater.

**Jerks.** Jerking movements of various portions of the body observed during periods of great excitement, especially when religious.

**Jerome,** ST., ab. 345–420. Sophronius Eusebius Hieronymus. Chief scholar among the Latin Fathers. He tr. the Bible into Latin (see VULGATE), lived as an ascetic near Bethlehem from 386, and exerted great influence.

Last Communion of St. Jerome (Vatican) by Domenichino.

**Jerome,** JEROME KLAPKA, b. 1861. English humorist and dramatist. *On the Stage—and Off*, 1885; *Idle Thoughts*, 1886; *Three Men in a Boat*, 1889; *Stageland*, 1890. He has since founded and edited the *Idler* and *To-day*.

**Jerome** OF PRAGUE, ab. 1370–1416. Bohemian reformer and martyr, friend and disciple of Huss. Arrested on his way to Constance April 1415, he was led to recant Sept., repented, spoke nobly at his trial May 26, 1416, and was burned May 30.

**Jerrold,** DOUGLAS WILLIAM, 1803–1857. English dramatist and humorist, a noted contributor to *Punch* from 1841. *Mrs. Caudle's Curtain Lectures*, 1843; *Chronicles of Clovernook*, 1846; *St. Giles and St. James*, 1851.—His son, WILLIAM BLANCHARD, 1826–1884, wrote plays, novels, and a *Life of Napoleon III.*, 4 vols., 1874–84.

**Jersey.** Chief of the English Channel Islands; 15 m. from the French coast. Area 45 sq. m.; pop., 1891, 54,518. See CATTLE.

**Jersey City.** Capital of Hudson co., N. J., on the Hudson, opposite New York City, with which its interests are identified. It has a large commerce, some of the ocean steamships sailing to and from the port of New York land here. Nearly all the railroads from the West have their termini here, the freight and passengers being transported to New York by ferry- and other boats. It has extensive manufactures, especially of meat packing and sugar refining. Pop., 1890, 163,003.

**Jerusalem.** From David's time capital of Israel, and site of its only permitted sanctuary; capital of Judah 975 B.C.; besieged by Pekah of Israel 741; destroyed by Nebuchadnezzar 588, rebuilt ab. 536; taken by Ptolemy Lagos 320; profaned by Antiochus Epiphanes 170; taken by the Maccabees 166, and by Pompey 63; improved and adorned by Herod; destroyed by Titus A.D. 70; rebuilt as Ælia Capitolina by Hadrian 130; taken

Jerusalem, from the Road to Bethany.

by Persians 614, by Mohammedans 637, by Crusaders 1099, and held till 1187; surrendered to Frederick II., who crowned himself King 1228; taken by Charismians 1244, by Turks 1516, and by Napoleon 1799. A Protestant bishopric was established 1841, a convention for preservation of the Holy Sepulcher held Sept. 5, 1862, and railway communication opened with Jaffa 1892. The Temple was built by Solomon ab. 1004 B.C., rebuilt ab. 515, and again 29–18 B.C. Pop. ab. 28,000.

**Jerusalem Chamber.** See WESTMINSTER.

**Jerusalem Oak.** *Chenopodium botrys*. Weed of the Goosefoot family, native of Europe, introduced into N. America; known also as Feather Geranium.

**Jervaulx Abbey.** Ruined abbey of Yorkshire. Built by Cistercian monks in 1156, it was dismantled in 1539, and its ruins were excavated in 1803. Its last abbot was hanged, 1537, for his part in the Pilgrimage of Grace.

**Jervis,** SIR JOHN, R.N., 1734–1823. Captain 1760, Admiral 1795; made Earl of St. Vincent for his memorable victory, Feb. 14, 1797, over a French fleet; naval hero and reformer.

**Jervis,** JOHN BLOOMFIELD, LL.D., 1795–1885. Chief engineer of the Croton Aqueduct, N. Y., 1836–43.

**Jervois,** SIR WILLIAM FRANCIS DRUMMOND, b. 1821. General of Engineers; engaged in planning fortifications; Gov. of Straits Settlements 1875, of S. Australia 1878, and of New Zealand 1882–89.

**Jeshurun.** O. T. name of Israel.

**Jessamine.** See JASMINE.

**Jessamine,** YELLOW. *Gelsemium sempervirens.* Showy, yellow-flowered vine of the natural family *Loganiaceæ*, native of the s. e. U. S.; known also as False Jessamine.

**Jesse.** Bethlehemite, father of King David.

**Jesse,** JOHN HENEAGE, 1815–1874. English official, author of several historical memoirs.—His father, EDWARD, 1780–1868, wrote much on natural history.

**Jesse Window.** Once it was common in churches to paint on the glass, or sculpture on the mullions of a church window, the genealogical tree of the father of David.

**Jesso.** See YEZO.

**Jessopp,** AUGUSTUS, D.D., b. 1824. English author. *Arcadia*, 1887.

**Jessup,** HENRY HARRIS, D.D., b. 1832. American missionary in Syria since 1856. *Greek Ch. and Prot. Missions*, 1891.

**Jest-Books.** Whether they profess to contain the humorous sayings of one man or not, in almost all cases they have been collections gathered from many sources. The wit so frequently ascribed to one person is generally the common property of many nations. Among famous English jest-books are *A Hundred Mery Talys* (ab. 1525), *Mery Tales, Wittie Questions and Quicke Answeres, very Mery, and Pleasant to be Redde* (ab. 1535), *Taylor's Wit and Mirth, Tarlton's Jests, Jests of Scogin, Joe Miller's Jest-Book* (1739), *Liber Facetiarum*, by Poggio Bracciolini (1450).

**Jesters,** COURT. Persons, who, in the employ of princes, furnish amusement by their wit, ofttimes disguised under the form of folly. They were known in the East as early as the 8th century; in England under William the Conqueror, if not earlier. Hitard and Will Somers, jesters of Edmund Ironsides and Henry VIII. respectively, were court fools whose names still remain.

Will Somers.

**Jesuits.** Society of Jesus; most highly centralized R.C. order, founded 1534 by Loyola. It has 4 classes, the main offices being held by the professed of the four vows, chastity, poverty, obedience, and submission to the Pope's direction to any part of the world. It is governed by a General residing in Rome. The order aims chiefly at teaching and mission work, and has shown great flexibility and effectiveness. It was abolished by Clement XIV. 1773, and restored by Pius VII. 1814. The order was abolished in Spain 1868, Germany 1873, and France 1880. In 1759 it had 22,589 members; it has now ab. 12,300.

**Jesus,** SOCIETY OF. See JESUITS.

**Jesus,** SON OF SIRACH, ab. 200 B.C. Author of *Ecclesiasticus*, a book esteemed by Catholics canonical, by Protestants apocryphal.

**Jesus Christ.** Son of God and Saviour of the world; b. at Bethlehem, of the House of David, ab. 4 B.C., in the reign of Augustus at Rome, and of Herod the Great at Jerusalem; brought up at Nazareth, in Galilee; crucified A.D. 30, after 3 or 4 years' public ministry. According to the Gospel narrative, he rose from the dead on the third day, and after forty days ascended to Heaven.

**Jesus Maria.** City of Colombia, 6,322 ft. above the sea. Pop., 1892, ab. 10,000.

**Jet.** Gagate of the ancients; named from the river Gages in Lycia; fossil wood or lignite, sometimes resembling cannel coal, of such fineness of texture and so readily polished as to be valued for ornament.

**Jet.** Isolated stream of water issuing from a nozzle or orifice. The vertical height to which it will rise depends mainly upon the pressure at the entrance to the nozzle: if this pressure be p pounds per sq. in., the vertical height in ft. will be less than 2.3 p, and perhaps only one-half as much under unfavorable conditions of wind or with a poor nozzle.

**Jethro.** Father-in-law of Moses.

**Jeton.** Counter or play-piece, resembling a brass or copper coin; struck in great abundance and variety in Germany from ab. 1400, and later in other countries; related to medalets, and often of numismatic interest.

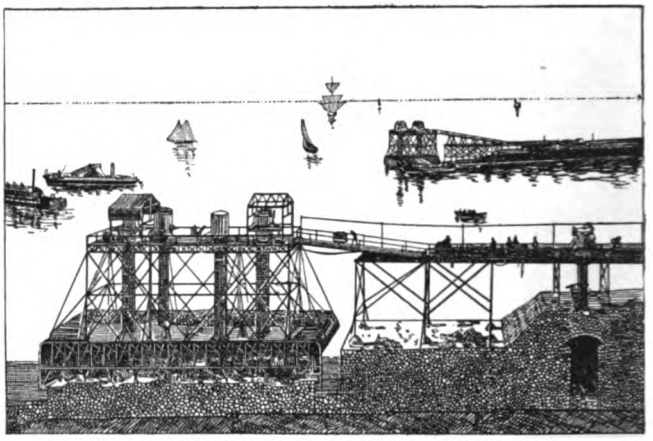
**Jet Pile.** Pile sunk by the help of a jet of water, which loosens the sand around its foot, while weights are applied on top.

**Jet Propeller.** Boat driven by the reaction of a stream of water forced by a pump out of an orifice in the stern. Boats can be propelled by this method, but usually the speed is low, and the expense high, owing to the low degree of efficiency. If v be the velocity of the water issuing from the orifice and u the velocity of the boat itself, the efficiency of jet propulsion is $2v \div (v+u)$. Hence the efficiency can reach unity only when v equals u, a condition which can practically never be approached.

**Jetsam.** Goods jettisoned and sunk. They belong to the government if not duly claimed by the owner.

**Jettison.** Casting goods overboard for the safety of a ship or its contents. As a rule the owner has no claim for goods properly jettisoned, except to contribution from those whose property has been benefited by his sacrifice.

**Jetty.** Embankment made at the mouth of a river parallel to the current, in order to deepen the channel. The entrances to the mouths of the Danube, Vistula, Maas, and many other European rivers, have been greatly improved by jetties. Those at the S. Pass of the Mississippi River, constructed 1875–78, increased the depth of the channel from 8 to nearly 30 ft., and thereby caused the foreign commerce of New Orleans to increase tenfold in four years. These jetties are about 1,000 ft. apart, 2¼ m. in length, and built of alternate strata of brush mattresses and stone. The cost, including the works at the head of the passes, was ab. $7,000,000.


Construction of the Jetties at the Port of La Pallice.

**Jeunesse Dorée.** Young men who struggled for a counter-revolution after the fall of Robespierre 1794. Gilded youths are now those who wander around spending money freely, indifferent to the sober realities of life.

**Jevons,** WILLIAM STANLEY, LL.D., F.R.S., 1835–1882. Prof. of Logic at Owens Coll., Manchester, 1866–76; and of Political Economy in Univ. Coll., London, 1876–81. His work can hardly be grouped with that of any particular school, and his whole intellectual life was a period of transition. *Logic*, 1870–80; *Theory of Political Economy*, 1871; *Principles of Science*, 1874; *Money and the Mechanism of Exchange*, 1875; *The State in Relation to Labor*, 1882; *Methods of Social Reform*, 1883.

**Jewel,** or **Jewell,** JOHN, D.D., 1522–1571. Bp. of Salisbury 1560. His *Apologia Eccl. Anglicanæ*, 1562, was condemned by the Council of Trent, and valued at home as the ablest defense of the Reformation.

**Jewelry.** The instinct for personal adornment led in the earliest times to the use of seeds, berries, shells, pebbles, and teeth for that purpose; and seems to have brought about rapid strides in jewelry. Samsi Vul IV. of Assyria (825 B.C.) is known to have worn a cross. The more ancient art of the Egyptians is attested by the objects found in their sarcophagi. They reveal a mastery of hammered, incised, and chased work, of soldering, of the use of gold plates and colored stones. Much has been learned of ancient jewelry from the specimens found (1859) in the coffin of the Egyptian Queen Aah-Hotep, and later in the ruins of Mycenæ discovered by Schliemann. Those of Cyprus and Etruria are equal to the work of any period. The Etruscan granulation of surfaces was long a puzzle until there were discovered in this century gold-workers in the Abruzzi to whom the art had come down as an heirloom. The Merovingians and Anglo-Saxons were characterized by their use of slabs of garnet set in gold plates. Celtic orna-

ments were chiefly of hammered work. Those of the Renaissance were profuse in ornamentation; during the 17th and 18th centuries they were of conventional designs aiming chiefly at a gorgeous massing of gold and jewels. Enormous bownots, stomachers, etc., were made in France during the reigns of Louis XIV., Louis XV., and Louis XVI. In the 19th century greater quantities have been manufactured, London, Paris, and New York being the leading centers of the trade. In 1890 there were in the United States 783 firms, capitalized at $22,246,508, employing 15,761 people and producing that year articles valued at $34,761,458. Paris annually sells more than 100,000,000 francs worth of jewelry.

**Jewel-Weed.** Herbs of the genus *Impatiens*, of the Geranium family, especially *I. biflora* and *I. aurea*, natives of e. N. America; known also as Touch-me-not.

**Jewett,** SARAH ORNE, b. 1849. New England author, noted for exact delineation and finished style. *Deephaven*, 1877; *A Marsh Island*, 1885; *Story of the Normans*, 1887; *A Native of Winby*, 1893.

**Jewfish.** Various fishes, mostly of the family *Serranidæ*. *Promicrops guasa*, found along the e. coast of the U. S., attains a weight of 700 lbs.

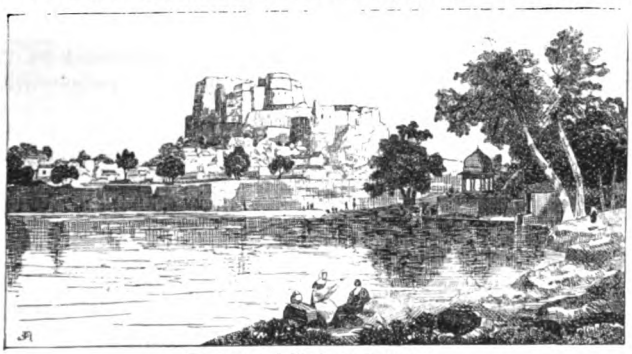
**Jews.** (1) Members of the tribe of Judah; (2) of the Kingdom of Judah, of which this tribe was the center; (3) of the nation of Israel after the Captivity; (4) sometimes, improperly, ancient Israelites, even before the birth of Judah. See HEBREWS.

**Jews,** PERSECUTION OF. See HEBREWS.

**Jew's Ear.** *Hirneola auricula-judæ*. Fleshy, edible fungus of wide geographical distribution, highly prized by the Chinese.

**Jews-Harp.** Musical instrument consisting of a flat metal tongue vibrating between two metal ribs held between the teeth. The free end diminishes to a wire bent at right angles, and is made to vibrate by the finger. The most famous player on this harp was a man from Würtemberg who possessed 16 of them tuned to different keys; he performed in London in 1828. The name was probably applied in derision.

**Jeypore,** or JAIPUR. One of the finest of the cities of British India, 155 m. s.w. of Delhi; capital of a native State.



Fortress of Shuhur, Jeypore.

It stands in a plain supposed to be the bed of a lake and is noted for the width and regularity of its streets. Pop., 1891, 158,905.

**Jezebel.** Daughter of Ethbaal, king of Sidon, and wife of Ahab of Israel; devoted to the Phenician worship; bitter persecutor of the Prophets; killed by Jehu ab. 883 B.C.

**Jezireh.** Town of Asiatic Turkey on an island in the Tigris. Pop. 9,600.

**Jezreel.** City of Galilee, favorite capital of Ahab, and scene of tragic events connected with his house.

**Jezreel,** VALLEY OF. See ESDRAELON, PLAIN OF.

**Jezzar.** See DJEZZAR.

**Jib.** Inclined member of a crane to which the back tie and the load are attached; it is built to resist stresses of compression.

**Jib.** Foremost sail of a ship, set upon a boom which runs out upon the bowsprit.

**Jib Boom.** Spar that runs out on the bowsprit.

**Jiddah,** or JEDDAH. On the Red Sea, 60 m. w. of Mecca, of which it is the port. Pop. ab. 20,000.

**Jig.** Machine used in ore dressing, in which the separation of ore from gangue is effected by pulsations of water acting through the meshes of a sieve. The process is known as jigging. Jigs are made in a great variety of patterns, some worked by hand, and some by mechanical power; some are intermittent in their action, and some are continuous, constantly discharging the richer product at one point and the poorer at another.

**Jig-Saw.** Reciprocating saw, of narrow and thin blade, used for interior curvilinear sawing of work which has a continuous margin. Where the inner parts of the design can be reached by a cut from any edge, the band saw is to be preferred. There are two types, the strained and unstrained. The strained are of two kinds: the sash saw, where the saw is stretched across a frame or sash, and the tension of the blade is given by a screw; and the types where the saw is drawn down by positive connection, and is pulled up by a spring. The spring links can be unhooked from the top of the saw to get it within the edge of the pattern. The reciprocation is universally given in power jig-saws by a crank disk and pitman. A number of forms take pains to secure uniform spring-tension on the saw by systems of leverage. The unstrained saw is simply guided at the upper end.

**Jim Crow.** Portable apparatus used for bending and straightening railroad rails.

**Jimmu-Tenno.** Semi-mythical personage revered as the founder of the present Japanese dynasty. He was fifth in descent from the sun, and came to the throne 660 B.C., from which time the national records are dated. He may have been a conquering leader, coming from Corea or the southern isles.

**Jingle-Ring.** Variety of blind-man's buff, played on a lawn within a roped boundary. All the players are blindfolded but one, who is provided with a bell which he must keep ringing continuously, while the others endeavor to catch him. The one succeeding within a given time wins the game or takes the ringer's place.

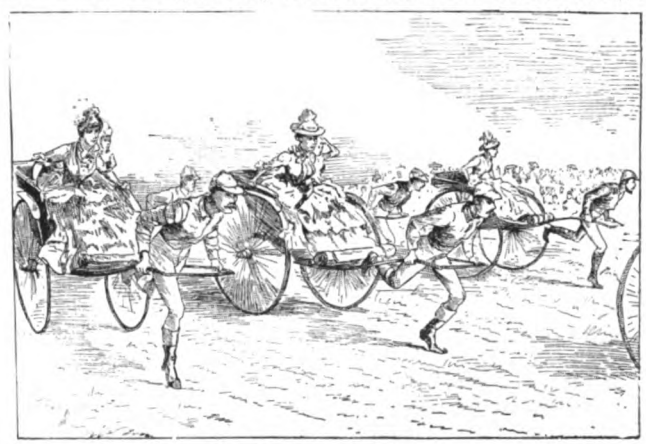
**Jingoes.** British Tories who urged an aggressive policy in the conduct of the Russo-Turkish war, 1878, and since: so styled from the vulgar oath "by jingo," used in a popular song of that day.

**Jingo-Kogo.** Japaness Empress, 201, who, after her husband's death, ruled during the minority of her son. During her vigorous reign, she secured friendly relations with China and compelled tribute from the kings of the three chief divisions of ancient Corea. She was deified after death.

**Jinnee.** One of the JINNS (q.v.).

**Jinns.** Spirits, good and evil, supposed by Arabs and Mohammedans to have sprung from fire, and to be able to take on various forms.

**Jinrikisha.** Two-wheeled vehicle drawn by a human runner. In use in Japan only since 1868, it is now found through-



Jinrikisha Race, Ceylon.

out the whole country. It is very light and accommodates only one passenger. Introduced by the Chinese into Ceylon, jinrikishas have become very popular there.

**Jirasek,** ALOIS, b. 1851. Bohemian historical novelist.

**Jirecek,** JOSEF, 1825–1888. Historian of Bohemian literature 1875.—His brother, HERMENEGILD, b. 1827, is a novelist and writer on Slavonic law.—Josef's son, CONSTANTIN JOSEF, b. 1854 at Vienna, Prof. Univ. Prague 1884, wrote a history of Bulgaria, 1876.

**Jiron.** Town of Colombia 175 m. n.e. of Bogota. Noted for gold and tobacco. Pop. 9,000.

**Jitomir,** or ZHITOMIR. Town of w. Russia, on a branch of the Dnieper, 80 m. w. of Kiev. Pop. 57,790.

**Joab.** Son of King David's half-sister Zeruiah, and his commander-in-chief; murderer of Amasa and Abner; put to death in old age by Solomon.

**Joachim,** ab. 1140–1202. Cistercian monk of s. Italy, founder 1192 or later of the Flora monastery near Cosenza; mystical theologian and supposed miracle-worker, whose writings were condemned by several Councils.

**Joachim,** JOSEPH, D.C.L., b. 1831. Hungarian musician, long the foremost representative of the classical school of violin-playing; director Berlin Hochschule für Musik, 1868. He has done little in composition, but his concertos for violin (op. 3 G minor, op. 11, known as the *Hungarian*, and G major, 1890) belong to the current virtuoso list.

**Joan,** POPE. Fabulous female, supposed to have disguised her sex, attained to the papacy, and held it as John VIII. 853–856.

**Joanes,** VICENTE, 1523–1579. Spanish painter of N. T. subjects.

**Joanna I.,** 1326–1382. Queen of Naples 1343; married 1333 to Andrew of Hungary, whom she murdered 1345, and successively to three others; long in exile; executed by Louis of Hungary.—Her grandniece, JOANNA II., 1371–1435, was Queen of Naples from 1414.

**Joannes Damascenus,** d. ab. 754. Theologian and hymn-writer taught by the Italian monk Cosmas. He opposed the iconoclastic measures of Leo the Isaurian in two memorable addresses.

**Joan of Arc,** MAID OF ORLEANS, 1412–1431. French heroine, who, acting under the impression of a supernatural calling, compelled the English to raise the siege of Orleans, 1429, and caused the Dauphin to be crowned as Charles VII. at

Joan of Arc.

Rheims, but was taken prisoner, tried, and burned as a sorceress at Rouen. Her beatification, 1894, fairly indicates the affectionate reverence which her rare character and great national services have won from posterity.

**Joash,** or JEHOASH. 1. Eighth king of Judah, ab. 877–837 B.C.; saved from massacre and installed as king when eight years old by the Highpriest Jehoiada. 2. King of Israel ab. 840–825 B.C.

**Job.** Hero of the 18th O. T. book, a magnificent Hebrew poem of uncertain date and authorship, discussing the justice of God in the afflictions of a righteous man.

**Job's Tears.** *Coix lachryma.* Large-flowered Indian grass, producing globular, pearly seeds the size of peas; cultivated for ornament.

**Jocelin de Brakelonde,** d. ab.1211. English Benedictine, author of a chronicle of the abbey of Bury St. Edmund's 1173–1202, pub. 1840.

**Jochmus,** JACOB AUGUST, BARON DE CATIGNOLA, 1808–1887. German officer in the service of Greece, Spain, England, and Austria; Field-marshal 1866.

**Jockey Club.** See HORSERACING.

**Jodelle,** ÉTIENNE, 1532–1573. French dramatist and poet. *Cleopatra*, 1552.

**Jodhpur.** City of Rajputana, India, capital of Marwar; founded 1459; seat of a British resident. Pop., 1891, 61,849.

**Jodl,** FRIEDRICH, b. 1849. Prof. Prague 1885. *Hume*, 1873; *Hist. Ethics*, 1882–89; *Psychology*, 1893.

**Joel.** Minor prophet, author of 29th O. T. book; commonly placed 850–800 B.C., but by some held as post-exilian.

**Joe Miller's Jests.** See JEST-BOOKS.

**Joe-Pye Weed.** *Eupatorium purpureum.* Large herb of the Composite family, native of e. N. America; known as Trumpet-Weed and Gravel-Root.

**Joggle.** Joint in which a strut abuts squarely against a surface cut out to receive it.

**Joggling Table.** Form of ore-dressing machinery in which the pulp flows slowly over a flat inclined surface, the separation of the richer from the poorer portions being facilitated by subjecting the table to a succession of sharp blows. These blows, or bumps, are sometimes given at the end, and sometimes at the side of the table.

**Jogues,** ISAAC, 1607–1646. French Jesuit, missionary in Canada from 1636; captured by Mohawks 1642, repeatedly tortured, and mutilated. Escaping by Dutch aid, he returned to Montreal after a brief sojourn in France, and in 1646 went among the Mohawks to die. His unworldly piety and heroic zeal place him high on the list of modern martyrs.

**Johannesburg.** Chief town of the Transvaal, in the gold region, 35 m. s. of Pretoria; founded 1886 and rapidly developed;

Mining at Johannesburg—Natives on their Way to Work.

headquarters of the Reform Committee, implicated in Dr. Jameson's raid 1896. Pop. ab. 50,000, of many nationalities, but largely British.

**Johannot,** TONY, 1803–1852. French artist of German birth, eminent chiefly as an illustrator of books.—His brother, CHARLES HENRY ALFRED, 1800–1837, did similar work.

**Johansson,** KARL FERDINAND, b. 1860. Swedish philologist.

**John the Baptist,** ST., ab. 4 B.C.–A.D. 29. Herald of Christ, son of Zacharias. He preached in the wilderness ab. 26 and 27, was imprisoned by Herod Antipas, and beheaded. His day is June 24.

**John the Evangelist,** ST., d. ab. 98. Son of Zebedee and Salome, brother of James the Elder, perhaps cousin of Jesus; youngest and best-beloved of the Apostles. He long survived the others, was the subject of many legends, and is supposed to have died at Ephesus. Internal evidence supports tradition in crediting him with the unique and wonderful fourth Gospel, though this has been much disputed. The first Epistle which bears his name is almost certainly his, and probably the second and third. Some have ascribed the Apocalypse to a doubtful "John the Presbyter." (See REVELATION.) In style, spirit, and substance, all these books harmonize with each other, and with the character, as generally conceived, of the "disciple whom Jesus loved."

**John I.** Pope 523–526.—II. 532–535.—III. 560–573.—IV. 640–642.—V. 685–686.—VI. 701–705.—VII. 705–706.—VIII. 872–882, active in politics, troubled by Saracen marauders, and murdered.—IX. 898–900.—X. Abp. of Ravenna, pope 914–929; active and warlike, reputed paramour of Theodora, and victim of her daughter Marozia.—XI. 931–936, son of Marozia.—XII. Octavian, son of Alberic and grandson of Marozia, enthroned 955 at 16; he crowned Otho I., who called a Synod which condemned the pope 963 for murder, incest, and other crimes; d. 964.—XIII. 965–972.—XIV. Peter, Bp. of Pavia, pope 983–984; starved in prison.—XV. 985–996.—XVI. 997–998, done to death by a rival.—XVII. 1003.—XVIII. Fasianus, pope 1003, became a monk 1009.—XIX. 1024–33.—XX. One of three rivals, 1045.—XXI. Pedro Juliani, Abp. of Braga, pope 1276–77.—XXII. Jacques d'Euse, ab. 1244–1334, Abp. of Avignon 1310, pope there from 1316; accused of heresy and noted for avarice.—XXIII. Balthasar Cossa, pope 1410, deposed by Council of Constance 1415.—This is not an illustrious list, and no later pope has chosen the name John.

**John,** 1166–1216. King of England 1199; son of Henry II. He lost most of his French possessions, was excommunicated and deposed by Pope Innocent III., and forced by the Barons to sign Magna Charta.

**John II.,** 1319–1364. King of France 1350; son of Philip VI., a prisoner in England 1356–60 and from 1364.

John II. of France, called the Good.

**John I.,** 1350–1395. King of Aragon 1387; patron of letters; founder of a school at Barcelona.

**John II.,** 1397–1479. King of Navarre 1425, and of Aragon 1458; occupied with domestic and foreign wars; father of Ferdinand.

**John I.,** 1358–1390. King of Castile and Leon 1379; long at war with Portugal.

**John II.,** 1405–1454. King of Castile and Leon 1407. His long reign was distracted by civil strife and wars with the Moors and with Aragon.

**John,** or JOAO, **I.,** "the Great," 1357–1433. King of Portugal 1383. He defeated the Moors in Africa 1415, and promoted naval explorations which added the Azores, Canaries, Cape Verde Is., and Madeira to his territories.—II. 1455–1495. King 1481. He promoted the discoveries of Diaz and De Gama, declined Columbus's overtures, sent a fleet to America 1493, and invoked a papal decision as to the rival claims of Spain and Portugal.—IV. 1604–1656. King 1640, expelling the Spaniards, who had held Portugal from 1580.—VI. 1767–1826. Regent 1799, King 1816; in Brazil with his court 1807–21.

**John III.,** OF POLAND. See SOBIESKI.

**John,** 1801–1873. King of Saxony 1854; tr. Dante 1839–49. He endangered his throne by siding with Austria in the war of 1866.

**John** OF ANTIOCH, d. 578. Patriarch of Constantinople 564; compiler of 86 "apostolical canons."

**John** OF AUSTRIA, 1546–1578. Natural son of Charles V.; victorious in several engagements with Mohammedans, especially at Lepanto 1571, thereby winning great reputation; Governor of the Netherlands 1576, where his energy was spent in vain.

**John,** ARCHDUKE OF AUSTRIA, 1782–1859. Commander in the wars with Napoleon 1800–9.

**John** OF CHUR, ab. 1305–ab. 1380. Swiss mystic, leader of the "Friends of God."

**John** OF DAMASCUS, d. ab. 780. Greek theologian; hymnist of high rank.

**John** OF GAUNT, 1340–1399. Son of Edward III.; Duke of Lancaster 1362; supporter of Wiclif; invader of Castile 1386; ancestor of Henry VII. and the Tudors.

**John** OF LEYDEN (BRUCKELS), 1509–1536. Anabaptist leader; "King of Zion" at Munster 1534; executed with tortures.

**John** OF NEPOMUK. See NEPOMUK.

**John** OF SALISBURY, ab. 1115–1182. Bp. of Chartres 1176; theologian and philosopher, pupil of Abelard.

**John Frederick,** 1503–1554. Elector of Saxony 1535–46 and 1553; son of JOHN THE CONSTANT (1468–1532, elector 1525); general of the Smalkald League 1546; defeated by imperialists at Mühlberg April 24, 1547, and imprisoned till 1552.

**John George I.,** 1585–1656. Elector of Saxony 1611; engaged in the Thirty Years' War on the Protestant side 1631–32, and on the Emperor's 1635–36.

**John,** EUGENIA ("E. MARLITT"), b. 1825. German novelist, known in America through Mrs. A. L. Wister's free translations. *Old Maamselle's Secret*, 1868; *Gold Elsie*, 1868; *Countess Gisela*, 1869; *Little Moorland Princess*, 1872; *At the Councilor's*, 1876; *In the Schillingscourt*, 1879; *Owl's Nest*, 1888.

**John o' Groat's House.** Northernmost point of Great Britain. John of Groat and 7 brothers from Holland are said to have settled here ab. 1489.

**Johns,** CLAYTON, b. 1857. American composer, chiefly of songs and salon pieces for the pianoforte.

**Johns,** JOHN, 1801–1847. Unitarian missionary at Liverpool 1836; hymnist.

**Johns Hopkins University.** At Baltimore, Md. Incorporated 1867, but not opened for instruction till 1876. It has an undergraduate department, but is specially organized for more advanced studies, aiming to make the student "an independent and original investigator in his chosen field." It had, in 1895, 70 instructors, besides 16 lecturers in the medical school; 285 graduate students, and 176 in undergraduate studies. In the 19 years preceding 1895, 312 had obtained the degree of Ph.D., 423 that of A.B.; 308 had become Fellows. The hospital was opened 1889, the medical school 1893. The Univ. issues journals of mathematics, chemistry, philology, biology, history, and political science, with other publications.

**Johnson,** ANDREW, 1808–1875. Seventeenth Pres. U. S.; M.C. 1843–53, Gov. of Tenn. 1853–57. U. S. Senator 1857. As military Gov. of Tenn. 1862–65, he displayed such energy against secession as to secure the Republican nomination for Vice-Pres.

Andrew Johnson.

Succeeding Lincoln, April 15, 1865, he speedily came into conflict with Congress over the terms of readmission to the Union of seceding States. Measure after measure was vetoed and passed over his veto till, in 1868, he was impeached by the House and narrowly acquitted by the Senate. He was again in the Senate 1875.

**Johnson,** BRADLEY TYLER, b. 1829. Gen. C.S.A. 1864; lawyer in Va. and Md. *Reports*, 1875.

**Johnson,** BUSHROD RUST, 1817–1880. Major-gen. C.S.A. 1864; Chancellor Univ. Nashville.

**Johnson,** CAVE, 1793–1866. M.C. from Tenn. 1829–37 and 1839–45; U.S. Postmaster-gen. 1845–49.

**Johnson,** EASTMAN, b. 1824. N.A. 1860. American genre and portrait painter.

**Johnson,** HENRY, 1783–1864. U. S. Senator from La. 1818–24; Gov. of La. 1824–28; M. C. 1834–39, Senator 1844–49.

**Johnson,** HERRICK, D.D., LL.D., b. 1832. Prof. Auburn Theol. Sem. 1874–80. *Revivals*, 1883.

**Johnson,** HERSCHEL VESPASIAN, 1812–1880. U. S. Senator from Ga. 1848–49; Judge 1849–53 and 1873; Gov. of Ga. 1853–57; candidate for Vice-Pres. 1860.

**Johnson,** JOHN B., b. 1850. Prof. of Civil Engineering in Washington Univ., St. Louis, 1883. *Surveying*, 1887; *Framed Structures*, 1892.

**Johnson,** MANUEL JOHN, F.R.S., 1805–1859. English astronomer.

**Johnson,** OLIVER, 1809–1889. American journalist and reformer; biographer of W. L. Garrison, 1880.

**Johnson,** PERCIVAL NORTON, F.R.S., ab. 1793-1866. English metallurgist.

**Johnson,** REVERDY, 1796-1876. U. S. Senator from Md. 1845-49 and 1863-68; U. S. Attorney-gen. 1849-51; Minister to England 1868-69.

**Johnson,** RICHARD MENTOR, 1781-1850. M. C. from Ky. 1807-19 and 1829-37; U. S. Senator 1819-29; Vice-President 1837-41.

**Johnson,** RICHARD W., U. S. A., b. 1827 in Ky. Gen. U. S. Vols. 1861-65; engaged chiefly in the West; biographer of Gen. Thomas, 1881.

**Johnson,** ROSSITER, LL.D., b. 1840. American author and editor.

**Johnson,** SAMUEL, D.D., 1696-1772. First pres. of King's Coll., N. Y. (now Columbia Univ.), 1754-63. *System of Morality*, 1746-52; *Hebrew Grammar*, 1767.—His son, WILLIAM SAMUEL, D.C.L., LL.D., 1727-1819, was U. S. Senator from Conn. 1789-91, and pres. Columbia Coll. 1791-1800.

**Johnson,** SAMUEL, LL.D., 1709-1784. English author, noted for genius and eccentricity. His literary life began in London 1737. His poem, *London*, appeared 1738; *Life of Savage*, 1744; *Irene*, a play, and a poem, *Vanity of Human Wishes*, 1749; *Rambler*, 1750-52; his *Dictionary*, 1755; *The Idler*, 1758-60; *Rasselas*, 1757; his edition of Shakespeare, 1765; *Western Islands*, 1774; *Lives of the Poets*, 1779-81. He is a familiar figure through Boswell's famous *Life* of him, 1791.

**Johnson,** SAMUEL, 1822-1882. Pastor at Lynn, Mass., 1853; editor, with S. Longfellow, of *A Book of Hymns*, 1846-48, and *Hymns of the Spirit*, 1864; author of *Oriental Religions, India, China, Persia*, 1872, '77, '85.

**Johnson,** SAMUEL WILLIAM, b. 1830. Director Conn. Agricultural Experiment Station and Prof. of Agricultural Chemistry in the Sheffield Scientific School 1856. *How Crops Grow*, 1868; *How Crops Feed*, 1870.

**Johnson,** THOMAS, 1732-1819. Gov. of Md. 1777-80; M.C. 1781-87; Associate Justice U. S. Supreme Court 1791-93.

**Johnson,** WALTER ROGERS, 1794-1852. Prof. Univ. Pa. 1839-43; writer on chemistry and coal.

**Johnson,** SIR WILLIAM, 1715-1774. B. in Ireland; settled on the Mohawk 1738; Colonel of the Six Nations 1744; Commissary of N. Y. for Indian Affairs from 1746; Councilor 1750; Major-gen. and Baronet 1755. He defeated the French at Lake George Sept. 1755, took Fort Niagara 1759, and for his services received 100,000 acres. J. Hall, built 1764 near the site of Johnstown, N. Y., still stands.—His son, SIR GUY, 1740-1788, served with the British and Indians: his estates were confiscated 1779.

**Johnson,** WILLIAM, LL.D., 1771-1834. Associate Justice U. S. Supreme Court from 1804; ed. *Life of Gen. Greene*, 1822.

**Johnson Grass.** *Sorghum halepense.* Coarse sorghum-like grass, valuable as a forage plant in the Southern States.

Johnson Grass.

**Johnston,** ALBERT SIDNEY, 1803-1862. Officer U. S. A. 1826-34 and 1849-61; active in Texas 1836-43; General C. S. A. 1861, with command in Ky. and Tenn. His death at Shiloh was a severe loss to the South.—His son and biographer, WILLIAM PRESTON, LL.D., b. 1831, prof. Washington and Lee Univ. 1867, became Pres. of La. State Univ. 1880, and of Tulane Univ., New Orleans, 1884.

**Johnston,** ALEXANDER, LL. D., 1849-1889. Prof. Princeton 1883; writer on U. S. history. *Connecticut*, 1887.

**Johnston,** ALEXANDER KEITH, LL.D., 1804-1871. Scottish geographer. *Physical Atlas*, 1847-56; *Gazetteer*, 1850.—His son and namesake, 1846-1879, explored Paraguay 1874, and d. in Africa. *Physical Geography*, 1877.

**Johnston,** ARTHUR, M.D., 1587-1641. Scottish physician in France; rector of King's Coll., Aberdeen; eminent as a Latin poet. His version of the Psalms, 1637, ranks next to that of George Buchanan, 1564.

**Johnston,** GEORGE, 1798-1855. Scottish writer on natural history.

**Johnston,** JAMES FINLAY WEIR, 1796-1855. Scottish agricultural chemist. His *Elements of Agricultural Chemistry and Geology*, 1852, a pioneer work, has gone through many editions, and is still a standard work of reference. *Chemistry of Common Life*, 1854.

**Johnston,** JOHN, 1791-1880. Born in Scotland; settled in Seneca co., N.Y., where he introduced the system of tile draining with great success; father of the practice in America.

**Johnston,** JOHN, LL.D., 1806-1879. Prof. Wesleyan Univ. 1837-73. *Chemistry*, 1840; *Natural Philosophy*, 1846-58.

**Johnston,** JOSEPH EGGLESTON, 1807-1891. Officer U. S. A. 1829-37 and 1838-61; general C. S. A. 1861-65, with command in Va. 1861-62, in the Southwest 1862-63, in Tenn. and Ga. 1863-64, and in the Carolinas 1865, to oppose Sherman; M.C. 1877. *Narrative*, 1874.

**Johnston,** JOSIAH STODDARD, 1784-1833. Half-brother of Gen. Albert S.; Judge in La. 1812-21, M.C. 1821; U. S. Senator from 1823.

**Johnston,** LAVIS H. J. Prof. of Vulcanology at Univ. Naples; engaged in special study of Mount Vesuvius.

**Johnston,** RICHARD MALCOLM, b. 1822. Georgia novelist. *Dukesborough Tales*, 1871-83; *Old Mark Langston*, 1884; *Two Gray Tourists*, 1885.

**Johnston,** SAMUEL, 1733-1816. M.C. 1781-82; Gov. of N. C. 1788-89; U. S. Senator 1789-93; Judge N. C. Supr. Ct. 1800-3.—His uncle, GABRIEL, 1699-1752, was Gov. of N. C.

**Johnstown.** City of Cambria co., Pa., on the Conemaugh, 78 m. e. of Pittsburg; nearly destroyed May 31, 1889. A reservoir a few miles above the town was swollen by heavy rains, which its waste weir was insufficient to discharge; the earthen

The Flood and Dam of Debris at the Railroad Bridge.

embankment failed, and a disastrous flood followed. Nearly $4,000,000 worth of property was destroyed, and 2,142 lives are known to have been lost: the number has been much more highly estimated. The town was rebuilt, and has extensive iron-works. Pop., 1890, 21,805.

**Joigneaux,** PIERRE, 1815-1892. French journalist, politician, and writer on agriculture.

**Joinery.** Art of joining woodwork by means of glue for the finishing of houses, the making of doors, windows, etc.

**Joint.** Fissure, or one of a system of parallel fissures, in rock, resulting from contraction on cooling or drying, or from pressure. Two or more intersecting systems of joints are sometimes seen in the same quarry. Joints are often at right angles to the planes of stratification, as the partings dividing columnar basalt into prisms.

**Joint and Several Liability.** Existing where two or more persons may be proceeded against collectively or separately, at the plaintiff's option. In contracts the liability is generally stated in terms; when it is not, it is joint if the interests are. Those who unite in committing a tort are liable jointly and severally. A judgment against one joint and several contractor bars an action against the others, save where the rule has been changed by statute; it is not so in torts in U. S.

**Joint Demand.** Derived or indirect demand for all the factors entering into the production of any finished commodity; caused by a demand for that product.

**Joint-Firs.** Plants of the natural family *Gnetaceæ*, natives of tropical regions.

**Joint Grass.** *Paspalum distichum.* Marsh grass, native of the s. e. U. S.

**Joint Ownership.** Where title to property is held by more than one person. Examples are: (1) joint tenancy, where there is unity of title, of time, of interest and possession; (2)

tenancy in common, where there is unity of possession; (3) tenancy by entirety, where an estate is conveyed to husband and wife jointly; (4) partnership.

**Joints.** The parts, taken as a whole, which form the connections between adjoining bones. They consist of the ends of the bones, usually covered with cartilage and ligaments which hold them together and form a closed cavity lined with synovial membrane, which secretes an unctuous fluid, acting as a lubricant. They are divided into immovable (synarthroses), such as those between bones of skull; mixed (amphiarthroses), where slight motion exists; and movable (diarthroses), where the motion is free. Inflammation of a joint is known as Arthritis.

**Joints in Masonry.** Spaces between contiguous dressed stones, usually filled with mortar. The vertical spaces are generally termed joints; the horizontal ones are called beds or builds. Joints in an arch should always be perpendicular to the direction of the pressure.

**Joint Stock Company.** One whose capital is divided into shares; species of partnership, which permits any owner of stock to transfer it to another and thus introduce him into the firm, the management being committed to a limited number of the stock holders. These associations are now regulated by statutes.

**Joint Supply.** That of things produced by the same process, so that the expense is no greater than that of producing one of them, *e.g.*, wheat and straw, or beef and hide.

**Joint Tenancy.** See JOINT OWNERSHIP.

**Jointure.** Formerly, joint estate limited to husband and wife; now, estate settled upon the wife, of which she is to have the benefit after her husband's death, in lieu of dower.

**Joint Weed.** *Polygonella articulata.* Much-jointed herb of the Buckwheat family, native of the e. U. S.

**Joinville,** FRANÇOIS FERDINAND PHILIPPE LOUIS MARIE D'ORLEANS, PRINCE DE, b. 1818. Third son of Louis Philippe; Rear-Admiral 1843, in a war with Morocco; in exile 1848–71; with Army of the Potomac 1862. *Études sur la Marine et Récits de Guerre.*

**Joinville,** JEAN, SIRE DE, 1224–1317. Biographer of Louis IX. of France, whom he accompanied on the 7th crusade, 1248–54. His work, written late in life, has value as a picture of the times.

**Joist.** Beam for supporting a floor, having its depth large compared with its thickness. Joists are generally braced laterally by small pieces called bridging. See BEAM.

**Jokai,** MAURUS, b. 1825. Hungarian novelist of immense activity and earnest patriotism. Of his many books, *The New Landlord, A Modern Midas*, otherwise *Timar's Two Worlds*, and *Eyes Like the Sea* (1894) have appeared in English. He is greatly beloved at home; the semi-centennial of his first book, Jan. 1894, was a national festival.

**Jokjokarta.** Town of Java, 55 m. s. of Samarang. Pop. 59,000.

**Joliet.** Capital city of Will co., Ill., on Des Plaines R., 37 m. s.w. of Chicago; site of the State Prison. Pop., 1890, 23,264.

Jolly's Balance.

**Joliet,** CHARLES, b. 1832. French novelist. *Mlle. Cherubin*, 1870; *Diane*, 1878.

**Joliet,** LOUIS, 1645–1700. French Canadian, who in 1673 traversed the Mississippi from the Wisconsin to the Arkansas.

**Jolin,** JOHAN KRISTOFFER, 1818–1884. Swedish actor, dramatist, poet, and novelist.

**Jolly,** FRIEDRICH, b. 1844. Prof. Strassburg 1873, Berlin 1891; writer on nervous diseases.

**Jolly's Balance.** Instrument for determining the specific gravity of small solids. It consists of a vertical spiral spring, at the lower end of which are suspended two scale pans. The lower one is always immersed in water, and is attached to the bottom of the upper one by a fine thread or wire. Just behind the pans is a vertical millimeter scale, etched on mirror glass, from which can be read the position of an index mark fixed on the suspending wire just above the upper pan. The solid is placed in the upper pan and the position of the index noted. The body is then replaced by standard weights till the index stands at the same scale division as before. If this weight be W, it represents the true weight of the body. The latter is now placed in the lower pan in the water and weights added to the upper till the old reading is reproduced. If this weight be $W_1$, it represents the weight of an amount of water equal in volume to that of the body; $\frac{W}{W_1}$ then is the specific gravity of the solid. Invented by Prof. Ph. Jolly, Munich, 1864.

**Jollyboat.** Small cutter rowed with four oars instead of six.

**Jomard,** EDME FRANÇOIS, 1777–1862. French Egyptologist and geographer.

**Jomelli,** NICOLA, 1714–1774. Italian opera composer of the Neapolitan School, director of the Conservatorio degli Incurabili in Venice, substitute chapelmaster at St. Peter's in Rome, and Hofkapellmeister in Weimar. He composed some admired church music.

**Jomini,** HENRI, BARON, 1779–1869. Swiss, general in the French and Russian armies. *Campaigns of the Revolution*, 5 vols., 1806; *Life of Napoleon*, 4 vols., 1827; *Art of War*, 1830.

**Jonah.** Hebrew prophet, ab. 800 B.C., mentioned 2 Kings xiv. 25. The 32d O. T. book is a moral tale of his adventures, whether historic or mythical, of unknown date and authorship: it probably uses legend as a vehicle of pious instruction.

**Jonas,** JUSTUS, 1493–1555. Prof. Erfurt 1516, Wittenberg 1521–41; associate and helper of Luther.

**Jonathan.** Eldest son and heir of Saul. Chiefly renowned for his magnanimous friendship with his father's rival David; killed with his father and brothers at Mt. Gilboa.

**Jonathan,** BROTHER. Nickname of J. TRUMBULL (q.v.), Gov. of Conn. 1769–83; thence of America and her people, as "John Bull" is of England and the English.

**Jonckbloet,** WILLEM JOZEF ANDREAS, 1817–1885. Dutch poet and critic, who wrote also in French.

**Jonctijs,** DANIEL, 1600–1654. Dutch poet.

**Jones,** CHARLES COLCOCK, LL.D., 1831–1893. Col. C.S.A. 1862–65; historian of Ga. 1883.

**Jones,** EBENEZER, 1820–1860. English poet, admired by a select few.

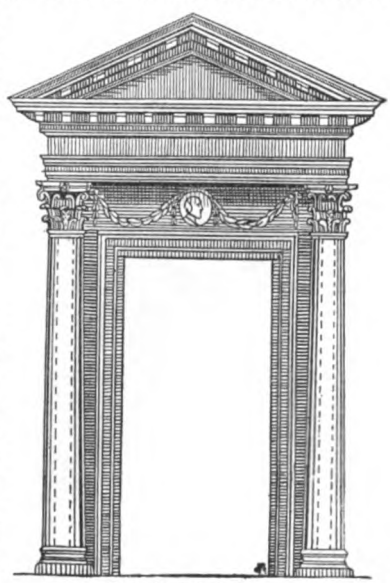
**Jones,** ERNEST, 1819–1869. Chartist leader, imprisoned 1848–50; author of several volumes of verse.

**Jones,** GEORGE, 1818–1891. One of the founders and conductor N.Y. *Times* 1851.

**Jones,** HENRY BENCE, F.R.S., 1814–1883. English scientific and medical writer.

**Jones.** HUGH BOLTON, b. 1848. N.A. 1883. American landscape painter.

**Jones,** INIGO, 1573–1652. English architect, the first of his time; trained on the Continent; Surveyor-gen. of royal buildings 1613. His finest work is the Chapel Royal (formerly Banqueting House) at Whitehall.


Door by Inigo Jones.

**Jones,** JACOB, U.S.N., 1768–1850. Commander 1810; noted for his capture, with the *Wasp*, of the British *Frolic*, Oct. 18, 1812.

**Jones,** JOHN PAUL, 1747–1792. Scottish-American naval hero, distinguished for many victories, some semi-piratical exploits on his native coast 1778, and chiefly for his capture of the *Serapis*, off Flamborough Head, Sept. 23, 1779, in which his own ship, the *Bon Homme Richard*, was sunk. He was in the Russian service 1788–89.

**Jones,** OWEN, 1809–1874. Decorator of the London Exhibition buildings and Crystal Palace, 1851–52; writer on art.

*Grammar of Ornament*, 1856.—His father, OWEN, 1741–1814, collected a multitude of Welsh poems, 500–1400, and pub. many of them 1801–7.

**Jones,** THOMAS RUPERT. Prof. of Geology at Sandhurst Coll., England; engaged chiefly in the study of the fossil *Entomostraca;* editor of Lartet and Christy's *Reliquiæ Aquitanicæ.*

**Jones,** WILLIAM, F.R.S., "of Nayland," 1726–1800. English theological and philosophical writer.

**Jones,** SIR WILLIAM, 1746–1794. English Orientalist, who won fame by his Persian grammar, 1770, and other linguistic works. He became a judge in Bengal 1783, founded the Asiatic Society 1784, and tr. works from Persian, Arabic and Sanskrit, the last language being largely introduced to the attention of Europeans through his labors. He may thus be called the founder of the study of Comparative Philology. *Law of Bailments*, 1781; tr. *Moallakat*, 1780; tr. *Sakuntala*, 1789–99.

**Jonesboro.** Village of Clayton co., Ga., where, Aug. 31, 1864, the Federals under Howard repulsed the Confederates under Hardee after a severe fight. Union loss 1,149, Confederate 2,000.

**Jongkind,** JOHAN BARTHOLD, 1819–1891. Dutch marine and landscape painter.

**Jongleurs.** Professional minstrels and entertainers, chiefly in France, 1000–1500; either wandering or attached to the household of some noble; distinguished from the troubadours, whose support did not depend on these arts. They improvised or recited their own verses, and sang those of others.

**Jonquil.** *Narcissus jonquilla.* Showy-flowered, bulbous herb of the natural family *Amaryllidaceæ*, native of Europe and widely cultivated for ornament.

**Jonson,** BEN, ab. 1574–1637. After Shakespeare, greatest of Elizabethan dramatists; most successful in comedy, and brilliant in lyrics. *The Alchemist*, 1610, is perhaps his best play.

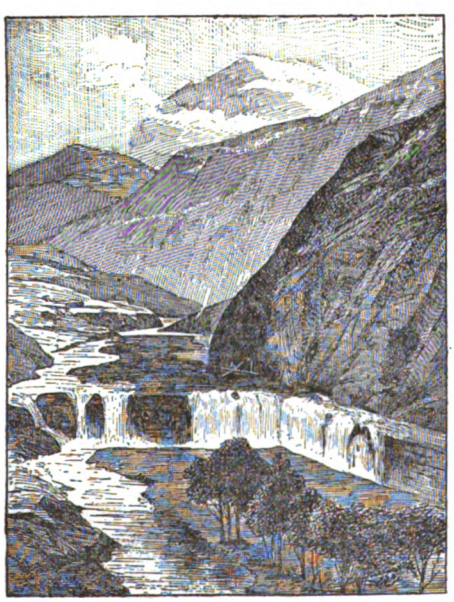
**Joplin.** City of Missouri, in Jasper co. Lead and zinc mines and smelting furnaces. Pop., 1892, ab. 17,440.

**Joram,** or JEHORAM. I. Ninth King of Israel, ab. 895–883 B.C.; son of Ahab; slain with his family by Jehu.—II. Sixth King of Judah, 889–885; son of Jehoshaphat.

**Joran.** Wind squall on Lake Geneva.

**Jordaeus,** JACOB, 1593–1678. Flemish painter of mythologic and religious subjects; coarse in taste but powerful in execution.

**Jordan.** River of Palestine, having a fall of 6 ft. a mile, from its source in Antilibanus to its embouchure in the Dead



Source of the Jordan.

Sea. Whole length 104 m. in a straight line, but, through its sinuosities, over 200. The Lake of Gennesaret, prominent scene of our Lord's ministry, is an expansion of it.

**Jordan,** DAVID STARR, M.D., LL.D., b. 1851. Pres. Indiana Univ. 1885, and L. Stanford Univ. 1891; writer on ichthyology.

**Jordan,** DOROTHEA, ab. 1762–1816. Irish actress, popular in juvenile parts from 1785; mistress of the Duke of Clarence (William IV.) 1790–1811.

**Jordan,** THOMAS, 1819–1895. Officer U.S.A. and C.S.A.; in command of Cuban revolutionists 1869–70. *Campaigns of Gen. Forrest*, 1868.

**Jordan,** WILHELM, b. 1819. German poet. *Nibelunge*, 1868.

**Jornandes,** or JORDANIS, 6th century. Historian of the Goths.

**Jortin,** JOHN, D.D., 1698–1770. Archdeacon of London 1764. *Eccles. History*, 5 v., 1751–73; *Life of Erasmus*, 1758–60; *Tracts*, 1790. *Works*, 11 v., 1805–10.

**Jorullo.** Volcanic peak thrown up Sept. 29, 1759, in Michoacan, Mexico; 4,265 ft. high, or 1,475 ft. above the plain.

**Joseph.** Son of Jacob and Rachel. His father's partiality, stimulating the hatred of his brothers, caused them to sell him into Egypt. Rising to the vice-royalty, he saved Egypt and

Joseph sold by his Brethren, by Georg Penz.

his own kindred in a time of famine, and established Israel for a long abode near the Nile. For purity of character and eminent usefulness he has been considered a type of Christ.

**Joseph.** Husband of Mary, mother of Jesus. The "brethren" of Jesus may have been his children by an earlier marriage.

**Joseph** OF ARIMATHEA. Disciple who gave burial to Jesus' body.

**Joseph I.,** 1678–1711. Son of Leopold I.; King of Hungary 1689, and of the Romans 1690; Emperor 1705.

**Joseph II.,** 1741–1790. Son of Francis I. and Maria Theresa; King of the Romans 1764; Emperor 1765; King of Hungary and Bohemia 1780. He proclaimed toleration 1781, assailed the power of the Ch. and of the nobles, and undertook vast and sweeping reforms which provoked violent opposition.

**Joseph** OF THE STUDIUM, d. 883. Greek hymnist.

**Josephine,** 1763–1814. Wife of Vicomte de Beauharnais 1779–94; mother of Eugène Beauharnais and Hortense, mother of Napoleon III.; married to Bonaparte 1796; crowned Empress 1804; divorced 1809.

**Josephson,** LUDVIG OSCAR, b. 1832. Swedish dramatist.

**Josephus,** FLAVIUS, 37–ab.105. Jewish historian and general, favored by Vespasian and his sons; resident in Rome from 71. His *Wars of the Jews*, ab. 75, and *Jewish Antiquities*, 93, have been widely read and are highly valued.

**Joshua.** Coadjutor and successor of Moses; leader of the Israelites in the conquest of Canaan. His deeds are recorded

Joshua Commanding the Sun to stand still, by A. Strähuber.

in the 6th O. T. book, which closes the Hexateuch. He lived ab. 1560 B.C., and reached the age of 110 years.

**Josiah.** Sixteenth successor of Solomon as King of Judah, ab. 641–610 B.C.: probably the best of his line; slain at Megiddo, in battle with the Egyptians, and bitterly mourned. In his reign, ab. 623, the "book of the law," whether Deuteronomy in whole or part, or with other Scriptures, was found in the temple.

**Josika,** MIKLOS, 1794–1865. Hungarian novelist.

**Josquin des Pres,** ab. 1450–1521. Most famous of the Netherland contrapuntists of his period, called Prince of Music. Many of his compositions have been saved, among them 32 masses.

**Josselyn,** JOHN, fl. 1675. English writer on New England. His *Rarities*, 1672, and *Two Voyages*, 1674, were repub. 1865.

**Jost,** ISAAK MARKUS, 1793–1860. German Jew, author of a *History of the Israelites*, 9 vols., 1820–29, with supplements, 6 vols, 1846–59.

**Jotapata.** Fortress in Galilee, held by Josephus against the Romans under Vespasian, who took and razed it 67, after a 47 days' siege.

**Jotham.** Tenth King of Judah, ab. 758–741 B.C; son of Uzziah.

**Jothunheim.** In Norse Mythology, home of the giants.

**Joubert,** BARTHÉLEMY CATHERINE, 1769–1799. French general, prominent in Italy; defeated and killed at Novi.

Jougs.

**Joubert,** JOSEPH, 1754–1824. French author of *Thoughts and Maxims*, pub. 1842, tr. 1867.

**Jouffroy,** THEODORE SIMON, 1796–1842. French philosopher, prof. at the Normal and Bourbon schools, and Coll. of France: representative of the doctrine of Reid and Stewart, separating psychology from physiology. *Melanges Philosophiques*, 1833; *Cours de Droit Naturel*, 1835; *Cours d'Esthétique*, 1843.

**Jouffroy d'Albans,** CLAUDE, MARQUIS DE, 1751–1832. French inventor of steam navigation. The Revolution, by driving him into exile and confiscating his property, destroyed the advantages of his priority.

**Jougs,** JUGGS, or JOGGS. Iron collar chained to a wall or pillar; used ab. 1550–1800 in Scotland and the Low Countries as a punishment.

**Joule.** Unit of work; viz., the work done in one second when the rate of working is one watt; or the work obtained when one coulomb of electricity falls through a difference of potential of one volt. The joule is a volt-coulomb, and is equivalent to

$$\begin{cases} 0.102 \text{ kilogrammeters nearly;} \\ 0.737 + \text{foot-pounds;} \\ 0.00024 + \text{calories;} \\ 10^7 \text{ ergs.} \end{cases}$$

**Joule,** JAMES PRESCOTT, LL.D., D.C.L., F.R.S., 1818–1889. English physicist. Pupil of Dalton. After experimenting with electro-magnetic engines, he turned his attention to the relations of heat to other forms of energy, and established the theory of the conservation of energy.

**Joule's Equivalent.** See HEAT.

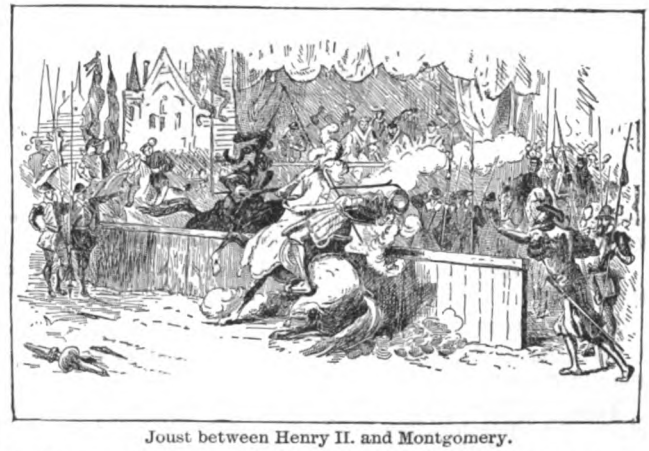
**Joule's Law.** The heat produced in any electric circuit is directly proportional to the product of the electromotive force and the current strength in that circuit; but as by Ohm's law the electromotive force is equal to the product of the current strength and resistance, the heat produced in a circuit is also proportional to the product of the square of the current strength into the resistance. In absolute measure the work done in any circuit in unit of time is the product of the electromotive force into the current strength; *i.e.*, $W=EC$; but $W=HJ$, *i.e.*, the work is always equal to the mechanical value of one heat unit multiplied by the number of such units. In general $W_1=HJt=ECt=C^2Rt$, in which t represents time.

**Jourdan,** JEAN BAPTISTE, COMTE, 1762–1833. French officer, commanding the Army of the North 1793, and that of the Danube 1799; Gov. of Piedmont 1800, and of Naples 1806; Marshal 1804, Count 1819.

**Journalism.** See NEWSPAPERS.

**Journeyman.** Workman who has passed through an apprenticeship or other training in his trade, and works for hire for some employer.

**Joust.** Chief feature of tournaments; contest between two cavaliers, heavily mailed and armed with lance or spear, each



Joust between Henry II. and Montgomery.

aiming to unhorse the other. The weapon most used was the lance, and to direct it anywhere but at the body of the antagonist was reckoned foul play.

**Jouvenet,** JEAN, 1647–1717. French painter, prof. Paris 1687.

**Jouy,** VICTOR JOSEPH ÉTIENNE, 1764–1846. French dramatist and novelist; Academician 1815.

**Jovellanos,** GASPAR MELCHIOR DE, 1744–1811. Spanish poet, dramatist, and statesman, exiled to Majorca 1801–8. His *Project of an Agrarian Law*, 1787, is highly valued.

**Jovianus,** FLAVIUS CLAUDIUS, 332–364. Roman Emperor 363, succeeding Julian. He made peace with the Persians by ceding the provinces beyond the Tigris, re-established Christianity as the dominant religion, and declared universal toleration.

**Jovicentric.** Pertaining to the center of Jupiter; *e.g.*, the jovicentric place of a star is its place as seen from Jupiter's center.

**Jowett,** BENJAMIN, D.D., LL.D., 1817–1893. Prof. of Greek at Oxford from 1855; tried for heresy 1860; master of Balliol Coll. 1870; Vice-Chancellor 1882–86. His fame

rests chiefly on his tr. of Plato, 5 vols., 1871–75. Tr. Thucydides 1881.

**Joyce,** ROBERT DWYER, M.D., 1836–1883. Irish-American poet. *Deirdre*, 1876; *Blanid*, 1879.

**Joynes,** EDWARD SOUTHEY, b. 1834. Prof. S. C. Coll. 1883; author or editor of French and German text-books.

**Joy Valve Gear.** Mechanism for the valves of steam engines, recently much used for marine engines. A short rod is attached by a pin to a point on the connecting rod of the engine, the other end of the short rod being pivoted to a radius arm attached to the frame of the engine. The first end therefore moves in an ellipse or oval. A second rod is pinned to the first at an intermediate point, for reduction of the amplitude of throw and to diminish the eccentricity of the curve of motion of this end, while the valve stem is pinned to the other extremity. This second rod vibrates upon a pin in a slide-block in a groove, the groove being capable of having its angular position adjusted on one side or the other of a mean position, and at varying angles with it. The throw of the valve is thus varied, and hence the cut-off is adjusted, or the distribution of steam reversed. See RADIAL VALVE GEARS and LINK MOTIONS.

**Juan,** DON. See DON JUAN.

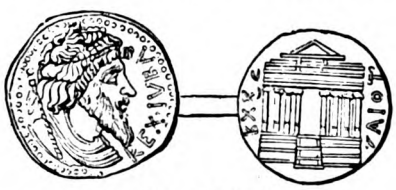
**Juan de Fuca,** STRAITS OF. Passage between Washington Territory and Vancouver Island.

**Juan Fernandez.** Island in the Pacific, ab. 400 m. w. of Santiago; 13 m. by 5; occupied 1704–9 by A. Selkirk, supposed original of Robinson Crusoe; penal colony 1819–35.

**Juarez,** BENITO PABLO, 1806–1872. One of the leaders of the liberal party. Pres. of Mexico from 1861. He led his country through the difficult period of the war with France and the career of Maximilian.

**Juarez-Celman,** MIGUEL, b. 1844. Pres. of Argentina 1886–90.

**Juba,** d. 46 B.C. King of Numidia, who joined Pompey against Cæsar.—His son, JUBA, d. ab. 20, was educated at Rome,



Coin of Juba I

wrote several historical and other works, was restored to his kingdom 30 B.C., and exchanged it for Mauretania 25 B.C.

**Jubal.** Descendant of Cain, and inventor of musical instruments.

**Jubbulpore.** See JABALPUR.

**Jubilate.** Psalm C; in the Anglican and P. E. service, sung in Morning Prayer after the second lesson.

**Jubé,** or ROOD-SCREEN. Open screen between the nave and choir of a church, often most elaborately designed and executed. One of the most famous French jubés is that of St. Etienne du Mont, in Paris.

**Jubilee,** YEAR OF. In Israel, every 50th year, when all landed property, except in towns, was to revert to its original owners. It was also a year of Release; declared by the Talmud never to have been actually observed.—In Catholic Ch., ordained 1300 to be held centennially, with a financial object; period diminished 1343 to half, 1389 to one-third, and 1470 to 25 years.

**Jubilees,** BOOK OF. Ancient Hebrew work, found in an Ethiopic version 1844. It deals with O. T. history by half-centuries, and is esteemed canonical in Abyssinia.

**Juch,** EMMA, b. 1861. Austrian singer, well known in America.

**Jud,** or JAD. Opening or groove hewn out with a pick to aid in breaking down the coal in large blocks.

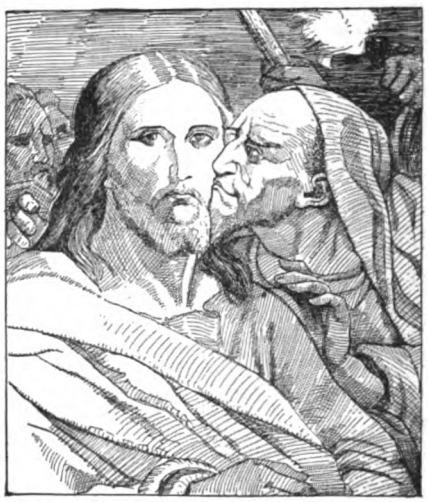
**Judæa,** or JUDEA. Kingdom of Judah; later, Palestine, or that part of it s. of Samaria.

**Judah.** Fourth son of the patriarch Jacob. The great tribe of his descendants, being forsaken by the other tribes, ab. 975 B.C., subsisted as a separate kingdom for ab. 400 years, and ultimately became the stock of the Jewish race.

**Judah ben Samuel.** See JEHUDAH.

**Judaizers.** Primitive Christians who held the Jewish ceremonial law to be binding on all believers; strenuously opposed by St. Paul.

**Judas Iscariot.** Betrayer of Jesus; son of Simon of Ke-



The Kiss of Judas, by Scheffer.

rioth; only one of the Apostles proceeding from Judæa, the others being Galilæans.

**Judas Maccabæus.** See MACCABEES.

**Judas** OF GALILEE. Leader of a Jewish revolt 6.

**Judas Tree.** Small trees of the genus *Cercis*, natural family *Leguminosæ*, bearing an abundance of showy flowers before the leaves; natives of the n. hemisphere. *C. canadensis*, the N. American species, is known also as Red Bud.

**Judd,** GERRIT PARMALEE, 1803–1873. Former of the first Hawaiian cabinet, 1843; Minister of Finance 1844–53.

**Judd,** JOHN WESLEY, b. 1840. Prof. of Geology at Royal School of Mines, S. Kensington, London.

**Judd,** ORANGE, 1822–1892. Editor *American Agriculturist*, 1853–81, and of the *Orange Judd Farmer*, 1884.

**Judd,** SYLVESTER, 1813–1853. American author. His chief work is the novel, *Margaret*, 1845.

**Jude,** or JUDAS. One of the 12 Apostles, surnamed Lebbæus or Thaddæus; brother of James the Less, and author ab. 62 of a brief epistle, 26th N. T. book.

**Judge.** Officer legally empowered to determine questions of law in litigations.

**Judge,** WILLIAM QUAN, 1851–1896. One of the founders of the American Theosophical Society, Nov. 1875, and its pres. 1895.

**Judge Advocate.** Officer designated, in the order convening a court-martial, to act as public prosecutor, recorder of the proceedings, and adviser of the Court. He is not a member of the Court and takes no part in its deliberations, in the findings, nor in awarding sentence. On the completion of the trial he forwards the proceedings, duly signed, to the reviewing authority. The judge advocate-general, in England and the U. S., is the adviser of government in reviewing these proceedings.

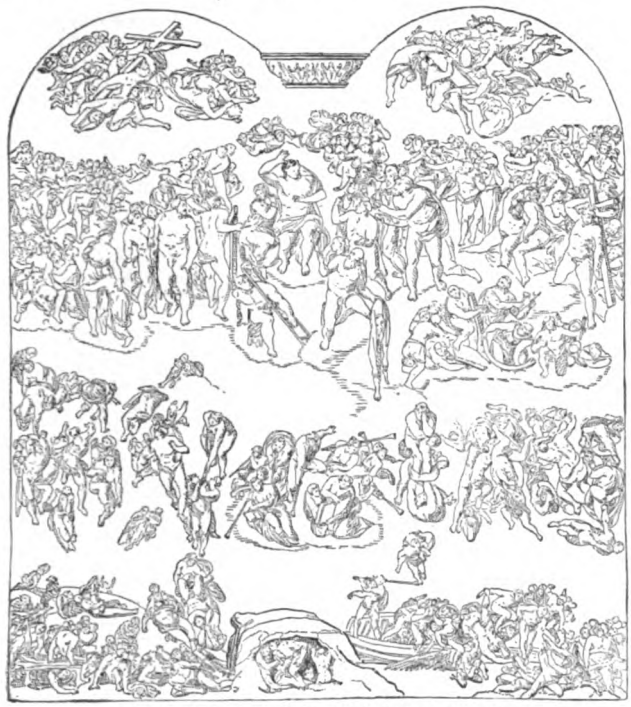
**Judges.** Seventh O. T. book, giving excerpts from Israelitish history under the occasional magistrates and generals called judges, the insufficiency of whose government resulted in the monarchy.

**Judgment.** Apprehension and assertion of the relationship between concepts and things; stage in the process of thinking which follows upon conception and may itself be followed by what we call reasoning.

**Judgment.** Interlocutory or final determination of an action. It may be delivered orally, but should be entered in writing. If valid, the cause of action is generally merged in it. It is generally enforced by execution, if not satisfied without process. Its obligation is quasi-contractual.

**Judgment,** LAST. Favorite theme of many artists because of its terrible interest to man and its possibilities of brilliant settings. Angelico, Bartolommeo, Cornelius, Michelangelo, Rubens, Tintoretto, all tried their skill on this subject. Mich-

elangelo's was once regarded as his masterpiece, but modern thought has refused to accept it as such.



The Last Judgment, by Michelangelo (Vatican).

**Judiciary.** Department which declares and applies the law in litigated cases. Modern states separate it as much as possible from the legislature and executive, and seek to secure its independence, fearlessness, and efficiency by giving its members a fixed tenure, relieving them from liability to civil suits for judicial acts, and giving them ample salaries.

**Judith,** Book of. Apocryphal book, received as canonical by the Roman and Greek churches, describing the deliverance of Israel from the Assyrian general, Holofernes.

**Judson,** Adoniram, D.D., 1788–1850. American missionary to Burmah 1813; imprisoned there 1824–25. He tr. the Bible 1830, and prepared a Burmese dictionary.—His third wife, Emily Chubbuck, 1817–1854, wrote, as "Fanny Forrester," essays, sketches, and poems.

**Juggernaut.** Hindu festival, in which a lofty car represents the moving world over which the god presides, and is drawn by the pilgrims. The story of multitudes crushed under the wheels is untrue.

Model of the Car of Juggernaut (British Museum).

**Jugglers.** In mining, timbers so set as to form one of the sides of a triangular passage, the other two being the floor of the mine and the standing coal.

**Juggling.** Popular amusement of earliest historical antiquity. Jugglers tossing balls are represented upon the early Egyptian monuments. The arts of the juggler are regarded as derived from the tricks with which the wonder-working priest imposed upon the ignorant, now degenerated into mere amusements. Among the American tribes, the Medicine Men pretend to work miracles by sleight-of-hand similar to the performances of our conjurers.

**Juglandaceæ.** Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Dicotyledons*, comprising 5 genera and ab. 35 species, widely distributed throughout the temperate regions of the n. hemisphere, and in the Andes of S. America; called the Walnut family.

**Jugular Fins.** See Fins.

**Jugular Process.** See Paramastoid Process.

**Jugular Veins.** These are situated in the neck and return the blood from it and the head, and are named anterior, external, and internal, according to their location.

**Jugulum.** Lower part of the throat in birds.

**Jugurtha,** d. 104 B.C. King of Numidia 117; at war with Rome 110–106; taken prisoner 106, led in triumph by Marius 104, and starved to death in a dungeon.

**Jujube.** Edible fruit of several species of *Zizyphus*, spiny shrubs of the natural family *Rhamnaceæ*, natives of the Mediterranean region.

**Jukes,** Joseph Beete, 1811–1869. Geological Surveyor of Newfoundland 1839; on surveys in England 1846, and Ireland 1850. *Manual of Geology*, 1857.

**Julaceous.** Resembling or pertaining to the flower-cluster known as an ament or catkin.

**Jülg,** Bernhard, 1825–1886. Prof. Cracow 1853, and Innsbruck 1863; writer on the languages of e. Asia, and on folklore.

**Julia,** 39 B.C.–14. Daughter of Augustus; wife of Agrippa 23, and of Tiberius 11 B.C.; banished 2 B.C.; mother of Agrippina, wife of Germanicus.

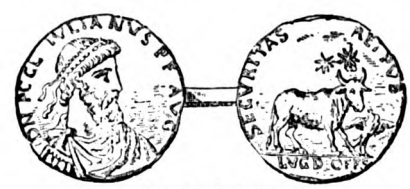
**Julian.** See Julianus.

**Julian,** Count. General of the Goths, Gov. of Ceuta in Spain. He betrayed his country to the Arabs 709, and aided them in its conquest 710–11. A doubtful tradition says that he sought revenge on King Roderic for the dishonor of his daughter.

**Julian Calendar.** See Calendar, Julian.

**Julianus,** Marcus Didius Severus, 133–193. Roman Senator and Consul; Gov. of Bithynia; Emperor for 66 days, having bought the purple from the pretorians.

**Julianus,** Flavius Claudius, "the Apostate," 331–363. Nephew of Constantine; Cæsar 355, Augustus 360, sole Emperor 361. The murder of his family by his nominally Christian cousins, with his own sufferings and dangers at their hands, turned him against the new religion, which he disestablished



Coin of Julianus.

on his accession; but his zeal for paganism stopped short of persecution. Few rulers of any age have surpassed him in ability and character; like his model, Marcus Aurelius, he combined the labors of a student and author with those of a statesman and soldier. He fought the German tribes in Gaul 356–360, and was slain in battle with the Persians. His chief extant work is *Misopogon*, a satire.

**Jülich.** Duchy of w. Germany, joined with Berg from 1423, and with Cleves 1521; incorporated with France 1801, and with Prussia 1814.

**Julien,** Noel, or Stanislas Aignan, 1799–1873. Prof. Coll. of France 1832; tr. of Chinese works in several departments of literature. *Syntaxe Chinoise*, 1869.

**Julius.** I. Bp. of Rome 337–352.—II. Giuliomo Rovere, 1443–1513. Cardinal 1471, Pope 1503; a lover of war and patron of art. He formed the League of Cambray against Venice 1508, and one against France 1512.—III. Giovanni Maria del Monte, 1487–1555, Pope 1550.

**Jullien,** Louis Antoine, 1812–1860. French musician whose fame rests chiefly on his monster concerts which he extended from Paris to London and the U. S. Of his music only dances and marches won popularity.

**Jullunder.** See Jalandhar.

**July.** Quintilio or fifth month of the old Roman calendar, became the seventh of the Gregorian. Renamed in honor of himself by Julius Cæsar.

**Jumieges,** ROBERT OF. Bp. of London 1044, Abp. of Canterbury 1050; exiled and deposed 1052.

View on the River Jumna.

**Jumieges,** WILLIAM OF. Historian of the Norman dukes to 1071.

**Jumna,** JAMNA, or JAMUNA. Branch of the Ganges, heading in the Himalayas. Length 860 m., drainage area 118,000 sq. m.

**Jump.** In mining, equivalent of fault. To "jump a claim," in Cal. especially, is to occupy and work one left without evidence of ownership.

**Jumper.** Drill for cutting holes in rock. It is held by one man while another strikes blows upon it with a heavy hammer.

**Jumpers.** Individuals affected with convulsive movements of the body, so that they have a tendency to progress by jumps. It may be due to distinct changes in the nervous symptoms or simply hysterical.

**Jumping Rope.** Common game, not only in Europe and America, but in the far East; played in the spring in Corea; favorite amusement of boys both in China and Japan.

**Juncaceæ.** Natural family of flowering plants, of the class *Angiospermæ*, and sub-class *Monocotyledons*, comprising 8 genera and ab. 210 species, found in all parts of the globe; few are in the tropics. Called the Rush family.

**June.** Old calendar fourth month, but the sixth in the present or Gregorian calendar, named after JUNO (q.v.).

**June 21, 1794,** BATTLE OF. Victory won by Lord Howe over a portion of the French fleet off Cape Race.

**June Berry.** See SERVICE BERRY.

**June Grass.** SEE BLUE GRASS.

**June,** JENNIE. See CROLY, MRS.

**Jung,** JOACHIM, 1587–1657. Prof. Rostock 1625; naturalist. *Opuscula botanico-physica*, 1747.

**Jung,** SIR SALAR, 1829–1883. Chief minister of Hyderabad, India, from 1853; reformer and wise ruler, in the British interest.

**Jung Bahadur,** SIR, 1816–1877. Prime-minister of Nepal 1846; knighted 1858, for support to Gt. Britain in the Mutiny.

**Jungermanniaceæ.** Order of *Hepaticæ*, including most of the species.

**Jungfrau.** Peak of the Bernese Alps, first ascended 1811. Altitude 13,671 feet.

Jungfrau.

**Junghaus,** SOPHIE, b. 1845. German novelist.

**Junghuhn,** FRANZ WILHELM, 1812–1864. German naturalist, long in the E. Indies. *Java*, 1852.

**Jungle Fever.** Very severe malarial fever observed in the E. Indies.

**Jungle Fowl.** Wild stock, from which our domestic fowls have been derived; inhabiting the jungles of s. India and adjacent islands. Four or five species are known. To a large extent they seem to be monogamous, but otherwise exhibit the general characteristics of our barn-yard fowls.

**Jungmann,** JOSEF, 1773–1847. Prof. at Prague from 1815; historian of Bohemian literature (1825), lexicographer. Tr. *Paradise Lost*, 1811.

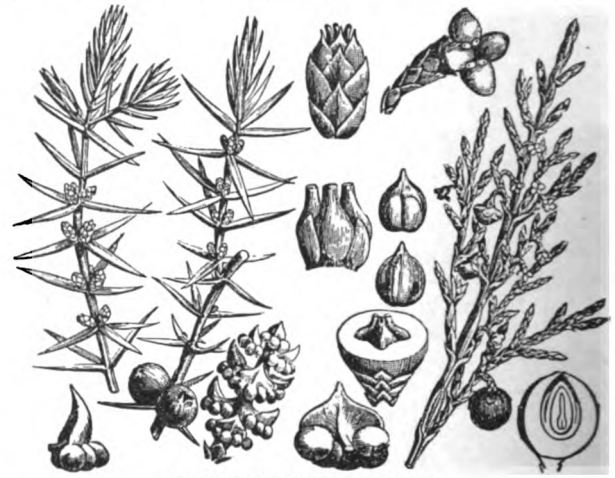
**Jung-Stilling,** JOHANN HEINRICH, 1740–1817. German novelist and mystic, prof. at Marburg 1787–1804. His autobiography, 5 vols., 1777–1804, was tr. 1835.

**Juniata.** Branch of the Susquehanna, entering it at Duncannon, Pa.; noted for its beauty. Length ab. 150 m.

**Junilius,** 6th century. Author of *Instituta divinæ legis*, pub. 1880.

**Junin,** LAKE. Largest lake in Peru, 37 m. long, 7 m. wide, situated in the western part 13,000 ft. above sea level. Formerly supposed to be the source of the Amazon.

**Juniper.** *Juniperus communis.* Evergreen shrub or tree of the natural family *Coniferæ*, native of the n. hemisphere,



Juniper (*Juniperus communis*).

bearing berry-like cones. The fruit is used in making gin and employed in medicine for its diuretic action.

**Junius,** LETTERS OF. In London *Advertiser* 1767–72, defending popular rights and attacking the government with great force and freedom. They caused much commotion at the time, and their authorship has been in question ever since. The most probable claimant is Sir Philip Francis.

**Junius,** or **du Jon,** FRANCISCUS, 1545–1602. French Calvinist, prof. at Heidelberg and Leyden. With Tremellius he tr. the O. T. into Latin, 1575–79.

**Junk.** Clumsy three-masted Chinese vessel, with high forecastle and poop.—Term also applied in the English navy to the salt meat used on long voyages.

**Junker,** WILHELM, 1840–1892. Russian traveler in Africa.

**Junkers.** Aristocratic party in Prussia under Bismarck's administration; literally, *younger* members of noble houses.

**Junk-Winds.** S. and s.w. winds in Siam; favorable for navigation.

**Juno.** Wife of Jupiter and queen of heaven; special protector of females. Women in childbed invoked her as Juno Lucina. June, her month, was the best time to marry. The Roman mint was in the temple of Juno Moneta. See HERA.

**Juno.** Third asteroid, discovered 1804 by Harding at Lilienthal, near Bremen.

**Junot,** ANDOCHE, 1771–1813. French general, distinguished in Syria 1799; made Duc d'Abrantes for victories in Portugal 1807; defeated at Vimiera 1808. He incurred Napoleon's wrath by the convention of Cintra, and did not regain favor in the German and Russian campaigns, and died insane.—His widow, LAURETTE DE ST.-MARTIN PERMON, 1784–1838, pub. 18 vols. of *Mémoires*, 1831–35.

**Junqueira Freire.** 1832–1855. Brazilian poet.

**Junta.** Political council in Spain or Spanish America.

**Junto.** Combination, open or secret, formed to secure political ends, as that of Whigs in the reigns of William III. and Anne. The Essex Junto was a group of extreme Federalists chiefly in Essex co., Mass., ab. 1800.

**Jupiter.** Supreme divinity of the Romans; eldest son of Saturn, dwelling on Olympus; lord of heaven, god of storms and thunder, father of gods and men; fountain of law, order, and kingly power, and special protector of Rome. Among his children were the Hours, Graces, Muses, and Fates. The Greek Zeus had nearly the same attributes.

**Jupiter.** Largest planet of the solar system, distant from the sun 483,000,000 miles. Its period of revolution about the sun is 11.86 years; diameter 86,500 miles; mass 316 times that of the earth; volume 1,309 times that of the earth; density 1.33 that of water; period of revolution about axis 9 hours 55 min-

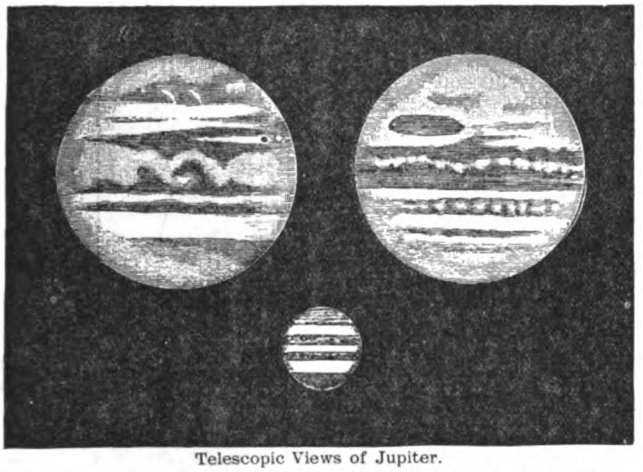
utes; gravity at surface 2.65 that at the earth. It has five satellites; four were discovered by Galileo 1610; no others were suspected until Sept. 9, 1892, when Barnard discovered the fifth in order of time with the 36-inch equatorial of the Lick observatory.

*Jupiter's Satellites*

| Name | Dist'nce in miles | Sidereal Period | Synodic Period | Diameter in m. | Eccentricity | Mass in time of primary |
|---|---|---|---|---|---|---|
| | | d h m s | d h m s | | | |
| 5th | 112,000 | 0 11 57 22.6 | | | | |
| Io | 261,000 | 1 18 27 33.5 | 1 18 28 35.9 | 2,500 | 0 | .00001688 |
| Europa | 415,000 | 3 13 13 42.1 | 3 13 17 53.7 | 2,100 | 0 | .00002323 |
| Ganymede | 664,000 | 7 3 42 33.4 | 7 3 59 35.9 | 3,550 | .0013 | .00008844 |
| Callisto | 1,167,000 | 16 16 32 11.2 | 16 18 5 6.9 | 2,960 | .0072 | .00004248 |

The new satellite is very minute, visible only in the most powerful telescopes.

When viewed through a telescope, the so-called belts are the most characteristic feature of the planet's surface; these



Telescopic Views of Jupiter.

are commonly of brown or reddish color, distributed in directions parallel to the equator. As they are constantly changing in appearance and position it is certain that they are only atmospheric in character. Besides the belts, there are spots of various form and color, some of which continue visible for many years. The most remarkable case known is that of the great red spot first seen July 1878 and still visible, though it has undergone great changes meanwhile. Some have supposed it to belong to the solid body of the planet; but, as it has been found to be itself in motion upon the planet, this is not possible.

The small density of the planet indicates a very extensive atmosphere. The temperature is believed to be much higher than that of the earth: the cooling process through which all of the planets are passing would advance less rapidly with the larger bodies, Jupiter, Saturn, Uranus, and Neptune.

**Jupiter Ammon.** See AMMON.

**Jura.** Mountain system in the form of parallel ridges, on the boundary between France and Switzerland. They trend in a curved line n.e., and are composed of recent stratified beds. Greatest elevation 5,656 feet.

**Jural Sentiments.** Those roused by a regard for or a violation of our own rights or those of others.

**Jurassic.** Division of the Mesozoic, well developed in the Jura Mountains of France, whence its name; synonymous with the English Oölitic: chiefly found in America on the Atlantic Border, among the Rocky Mountains, and in the Arctic Regions. See COLUMN.

**Jura-Trias Period.** In America, that including the JURASSIC and TRIASSIC (q.v.) periods of the European scale.

**Jurien de la Gravière,** JEAN BAPTISTE EDMOND, 1812–1892. French Admiral 1855; Academician 1888; historian of the naval wars 1793–1815. *Voyage en Chine*, 1854.—His father, PIERRE ROCH, 1772–1849, was also an admiral.

**Jurien,** PIERRE, 1637–1713. Huguenot, prof. at Sedan 1674–81, then pastor at Rotterdam; active in controversy. *Calvinism and Popery*, 1682; *Hist. Council of Trent*, tr. 1684; *Hist. Doctrine and Worships*, tr. 1705.

**Jurin's Law.** Formula for the elevation of a liquid in a capillary tube; viz., if r be the radius of the tube, $\rho$ the density of the liquid, $\alpha$ its angle of contact, T the surface tension, and h the mean elevation, then $h = \frac{2T\cos\alpha}{rg\rho}$; if $\alpha > \frac{\pi}{2}$, h is negative and the liquid is depressed.

**Jurisdiction.** Authority vested in an officer or court to make a judicial determination of a controversy. It may be general, as that of the higher courts of record, or limited, as that of a justice of the peace: it may be exclusive, or exercisable by one of several courts; it may rest upon usage, or it may have its source in a constitution or a statute.

**Jurisprudence.** Properly, scientific statement of general legal principles. Modern writers on this subject are generally divided into the positive and historical schools: the former basing all law upon the authority of the State, and refusing the term to any rule which is not expressly or impliedly commanded by the State: the latter holding that the law of every State is constantly changing under the influence of historic forces, and that a considerable portion of it at any given time rests not on the command of the sovereign power, but upon involuntary habit. At present many writers disclaim classification in either of the foregoing schools, and are attempting, by the comparative study of various legal systems, to reach a scientific statement of legal doctrine which shall be worthy of the title.

**Jurisprudence,** MEDICAL. Rather formless body of rules which relate to the medical expert's evidence in litigated cases.

**Juroku Musashi,** or SIXTEEN SOLDIERS. Japanese game of Fox and Geese, played on a board with sixteen men who endeavor to corner and pen up the Taisho or "General." The board is analogous to the diagram employed in the Corean game of Nyout, and doubtless originally had a cosmical significance.

**Jury.** 1. Grand. Authorized body of not less than 12 and not more than 23 men, sworn to examine into all charges of criminal misconduct properly presented to them, and to make proper presentments to the court thereupon. 2. Petit. Body authorized by law and sworn to deliver a verdict upon the evidence presented to them, upon the trial of a civil or criminal action. The qualifications, summoning, and impaneling of jurors are generally prescribed by statute. Among the Saxons a man might be cleared of a charge of crime if 12 juratores swore that they believed him innocent. Dr. Stubbs, however, derives the modern jury system from the Franks, and ascribes the form which it assumed in England to the Plantagenets. In Scotland the verdict of a majority suffices, or a verdict of "not proven" may be given: in France, since 1831, a majority of two-thirds is required. The system of trial by jury was introduced in France 1791; in Russia 1866; abolished in Austria 1852.

**Jury Mast.** Temporary mast, erected in place of one that has been carried away by accident.

**Jus Gentium.** Body of rules in the Roman law, supposed to have been used by all nations because of their inherent justice; in distinction to jus civile, or ancient local law of Rome.

**Jusserand,** JEAN JULES, b. 1855. French writer, chiefly on English subjects. His *Eng. Wayfaring Life in Middle Ages*, 1884, was crowned by the Academy and tr. 1889. *Wm. Langland*, 1893; *Literary Hist. English People*, 1895; *English Essays*, 1896.

**Jussieu,** ANTOINE LAURENT, 1748–1836. Prof. Jardin des Plantes, Paris, 1770–1826. *Genera plantarum*, 1789; *Introductio in historiam plantarum;* and many memoirs.—His son, ADRIEN, 1797–1853, succeeded to his chair 1826. *De Euphorbiacearum*, 1824; *Groupe des Méliacées*, 1830; *Botanique*, 1843–55; *Monographie des Malpighiacées*, 1843.

**Just Claims.** For the performance of actions not distinctly specified in a contract or required by law, but arising from general custom or reasonable expectation.

**Juste,** THÉODORE, 1818–1888. Belgian historian. *Founders of Belgic Monarchy*, 27 vols., 1865–81.

**Juste Milieu.** Happy mean; principle of political moderation, urged in France 1830–48.

**Justice.** Idea and desire that each person should have that which he deserves, or to which he has a right. Conduct which respects the rights of others; positive when it represents conduct voluntarily adjusted to normal social conditions, and punitive when it represents requital for injury done or threatened; usually based upon the equality of men, and in the true sense a social, not an individual, virtue, except as an abstract term for good will, or righteousness, which it sometimes is.

**Justice,** BUREAU OF MILITARY. Judge-Advocate-General's Department, consisting of one judge-advocate-general with rank of brigadier-general, one assistant (colonel), three deputies (lieut.-colonels), and three judge-advocates (majors). There are also now three acting judge-advocates of military departments, officers of the line temporarily detailed and ranking as captains of cavalry.

**Justice,** HIGH COURT OF. According to the Acts of Judi-

cature, 1873–76, the English Supreme Court consists of the High Court of Justice and the Court of Appeal. The former comprises a CHANCERY DIVISION (q.v.) and a Queen's Bench Division.

**Justice,** LORD CHIEF. Chief Judge of the Queen's Bench Division of the English High Court of Justice.

**Justice** OF THE PEACE. Judicial and administrative magistrate of limited jurisdiction, appointed or elected for a subdivision of the State. His duties are generally regulated by statute, and differ greatly in different jurisdictions. The office was created in England ab. 1264.

**Justices,** LORDS. Since the Norman conquest English sovereigns have been accustomed on leaving the kingdom to appoint one or more persons to exercise supreme power in their absences. For a time the justiciar exercised this appointing power. But after the deaths of William and Mary the sovereigns frequently delegated their authority. Twice during the reign of Victoria has the subject been considered, and through Parliamentary debates, especially in 1845, it has practically been settled that though the great seal cannot be used out of the realm, the sovereign still by sign-manual can command with authority, and lords-justices have ceased to be.

**Justiciary Court.** Highest criminal court in Scotland. Consists of 7 judges of the Court of Session. Sitting usually in Edinburgh, it also holds circuit courts in Perth, Dundee, Aberdeen and Glasgow. Its jurisdiction covers all crimes, and it acts as a final court of appeal from inferior criminal courts.

**Justifiable Homicide.** Killing in self-defense, or for the prevention of any forcible and atrocious crime, as nocturnal burglary.

**Justification** BY FAITH. Doctrine made by Luther the keynote of his system, in opposition to the supposed tenet that men are justified by works; generally emphasized by evangelical Protestants. St. Paul had much to say on one side of the argument, and St. James something on the other.

**Justin I.,** 450–527. Byzantine Emperor 518; a Dacian peasant, who became commander of the Imperial guards, succeeded Anastasius I., and effected a temporary union of the Western and Eastern churches in 519.

**Justin II.,** d. 578. Nephew and successor of Justinian I.; Emperor 565. He lost Italy, and was unsuccessful in his wars with Persians and Avars.

**Justin.** Roman writer, probably of 3d century. His abridgement of the history of Pompeius Trogus (1st century) was pub. 1470.

**Justin Martyr,** ab. 105–ab. 166. Christian philosopher, probably in Rome, of whose works two apologies and a *Dialogue with Trypho* survive.

**Justinian,** FLAVIUS ANICIUS, 483–565. Byzantine Emperor 527; nephew and successor of Justin I.; famous for his scheme

Justinian, Theodora and Attendants (Mosaic Picture at S. Vitaiis, Ravenna).

of consolidating and abridging the laws of the Empire. The Codex of Imperial Constitutions was issued 529, the Institutes and Digest or Pandects 534. He expelled the philosophers, was much occupied with theology, and through his generals warred with the Persians for 22 years, with the Vandals in n. Africa and with the Goths and Lombards in Italy. He was great only in procuring the services of able men.

**Justinian II.,** 669–711. Byzantine Emperor 685; son and successor of Constantine IV.; mutilated and exiled 695; again in power 705.

**Jute.** Fiber of *Corchorus capsularis* and *C. olitorius*, herbs of the natural family *Tiliaceæ*, natives of India; widely cultivated in warm regions. It is used in the manufacture of coarser fabrics, carpets, and bags; the butts are used in paper making. Its culture is as yet in the experimental stage in the Southern States. See GUNNY BAGS.

**Jute,** AMERICAN. See VELVET-LEAF.

**Jutes.** Low-German tribe, who came with Hengist and Horsa tradition says to Britain 449 to aid the Britons to repel the marauding Picts. They landed at the island of Thanet, scattered the Picts, and soon after founded the kingdoms of E. and W. Kent.

**Jutland.** Mainland of Denmark; peninsula between North

Jutlanders.

Sea and Cattegat; anciently inhabited by Cimbri, then by Jutes and Northmen. Area 9,754 sq. m.; pop., 1890, 942.361.

**Juvenalis,** DECIMUS JUNIUS, ab. 55–ab. 135. Greatest of Roman satirical writers, whose life is but little known. He is said to have practiced oratory, and to have been banished in old age to Egypt. His vivid descriptions and scathing rebuke of the morals of the day have found many admirers, ancient and modern. Sixteen satires in hexameter meter are extant; all were tr. 1802 by Gifford, five by Dryden, and two were paraphrased by Dr. Johnson.

**Juveneus,** CAIUS VETTIUS AQUILINUS. Spanish priest, author ab. 330 of a Latin epic, *Evangelical History*, in four books.

**Juvenile Offenders.** Criminals under age are generally objects of pity, and when convicted are often sent to a reformatory rather than to prison. Many religious and charitable organizations put forth efforts for the criminally inclined youth, and the ragged schools of John Pounds in England and the Five Points Mission of Rev. Mr. Pease in N. Y. City have been very successful and have resulted in a material decrease of crime, both juvenile and adult, except where overbalanced by the immigration of criminals. See REFORMATORIES.

**Juxon,** WILLIAM, D.D., 1582–1663. Bp. of London 1633; Lord High Treasurer 1635–41; attendant of Charles I. on the scaffold; Abp. of Canterbury 1660.

**Jynx.** Maiden of varying parentage in Greek legends, changed to a bird, and bearing a part in the story of Jason and Medea.

# K

**Ka.** Spirit in the Egyptian tomb, as long as the mummy was complete.

**Kaaba.** Chief sanctuary of Mecca, dating from long before Mohammed; rude stone building ab. 40 ft. square; destroyed by fire 683 and rebuilt; again rebuilt 1626; alleged to have been erected by Abraham and Ishmael. It contains in an outer angle a black stone a span long, perhaps of meteoric origin, said to have been given by Gabriel to Abraham.

**Kaalund,** HANS VILHELM, 1818–1885. Danish poet.

**Kabala,** or KABBALAH. See CABBALA.

**Kabul.** See CABUL.

**Kabyles.** See BERBERS.

**Kadesh-Barnea.** Station of the Israelites in the wilderness; identified 1842–81.

**Kadessia,** or KADISIYEH. Fortified town between the Euphrates and the Arabian desert, where was fought, 636, a desperate 4-days' battle between 120,000 Persians under Rustam, and the Arabs, 30,000 only the first day, under command of Sa'ad, but led by Kaled. The Persians were utterly routed, and Rustam slain with 40,000 of his men. This action was the first of a series which resulted in the overthrow of the Sassanian Empire.

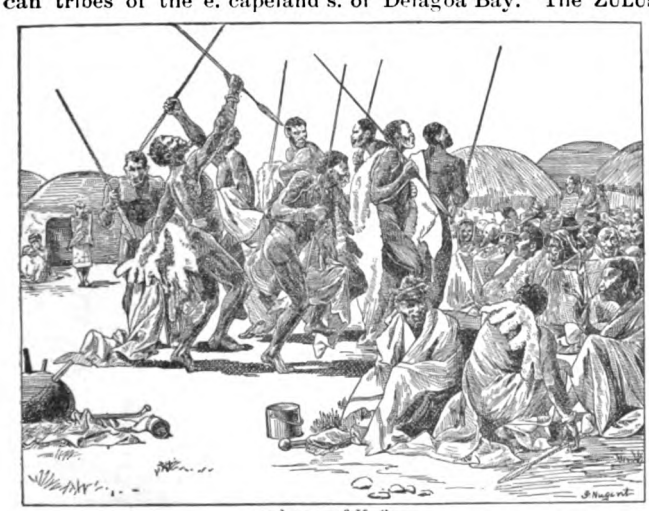
**Kadiak,** or KODIAK. Island s. of Alaska, in lat. 56°–58° N.; discovered 1741; held by Russia 1768–1867. Area ab. 4,000 sq. m.; pop. ab. 2,000.

**Kaffa.** Crimean port, the ancient Milesian colony, Feodosia, and in 13th century the Genoese trading place Kaffa. The Turks took it 1475 and the Russians 1792. Pop. ab. 11,000.

**Kaffraria.** Southern Africa, inhabited by the Kaffirs.

**Kafiristan.** Region of n. e. Afghanistan, occupied by non-Mohammedan tribes of supposed Aryan descent. Area ab. 5,000 sq. m.

**Kafirs,** KAFFIRS, or CAFFRES. In a restricted sense, African tribes of the e. capeland s. of Delagoa Bay. The ZULUS



A dance of Kafirs.

(q.v.) are the chief division. In a broader sense, all the tribes of the e. part of Central and S. Africa are included; *e.g.*, the Bechuana, Suahili, and Marutse.

**Kagoshima.** City in s. Japan, bombarded by the British 1863. Pop. 45,097.

**Kai-Fung.** Capital of Honan, China, on the Hoangho. Pop. 100,000.

**Kainite.** $KCl.MgSO_4+3H_2O$. Double salt of potassium chloride and magnesium sulphate, found in the Stassfurt salt mines, Germany, and used as a fertilizer.

**Kaiser,** FRIEDRICH, 1814–1874. German playwright.

**Kaiserswerth.** German town on the Rhine, seat of a Lutheran house for the training of deaconesses, founded by T. Fliedner 1835. Pop. ab. 2,400.

**Kaiser Wilhelm's Land.** German protectorate in New Guinea, established 1884; area 72,000 sq. m., pop., 110,000.

**Kakemono.** Japanese hanging pictured scrolls; commonest form of pictorial art in e. Asia. Used in both temple and household adornment, the subjects of these pictures are varied; many come from schools of Buddhistic art in China and Japan. Such pictures are mounted in accordance with special laws. The materials are the most decorative that can be procured, and are disposed after an especially complex pattern, while the ordinary wood or ivory appendages at the end of the rolling sticks are replaced in the typical Buddhist kakemono by caps of gilded bronze or more precious metal engraved with the symbol of the lotus. Collections are in the British Museum, and the Boston Museum of Fine Arts.

**Kalahari Desert.** Almost uninhabited waste in S. Africa, in lat. 21°–26° S. It has some vegetation, but little water.

**Kalakaua,** DAVID, 1836–1891. King of the Sandwich Islands 1874.

**Kalamazoo.** Capital of Kalamazoo co., Mich.; settled 1829. Kalamazoo Coll., incorporated by Baptists 1855, has 11 teachers and ab. 235 students. Pop., 1890, 17,853.

**Kalamazoo College.** In Mich. town of same name, founded 1855. Baptist, 11 professors, 55 students.

**Kalamazoo River.** Flowing into Lake Michigan, through that State, 200 miles long, 40 miles navigable for boats.

**Kalb,** JOHANN. See DE KALB.

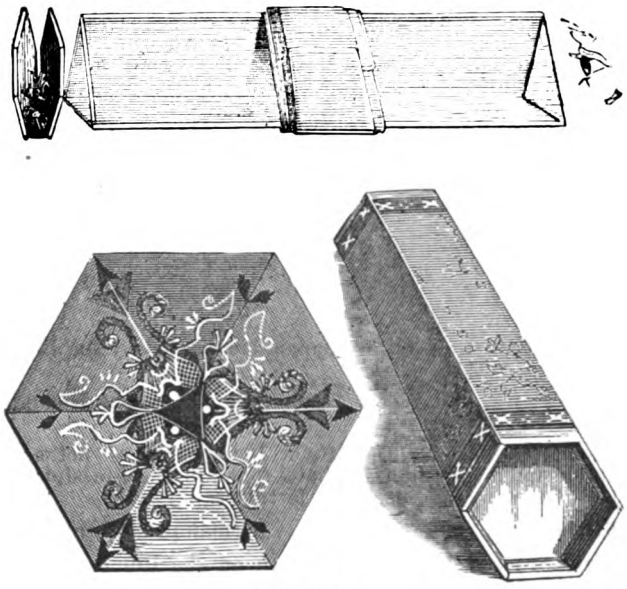
**Kalbeck,** MAX, b. 1850. German writer and composer.

**Kale.** Variety of Cabbage (*Brassica oleracea*).

**Kaleidophone.** Instrument for illustrating Lissajou's curves, representing the resultants of combining two or more simple rectangular harmonic motions in different directions or phases. One form, devised by Prof. Wheatstone, consists of a steel rod or set of rods, usually of rectangular cross section, one end of which is rigidly fixed, while the other, terminating in a bright bead, is free to vibrate. If the rod be set vibrating in a direction oblique to its two directions of symmetry, the bead will describe a characteristic curve, which will represent the resultant of compounding two simple harmonic motions at right angles to each other, and of periods corresponding to the periods of the rod in the directions parallel to the edges of a right section; *e.g.*, if the simple harmonic motions be of the same period, but one a quarter period in advance of or behind the other, the resultant is a circle; if the difference of phase be half a period, an oblique straight line.

**Kaleidoscope.** Optical instrument invented 1817 by Sir

D. Brewster. The principle is the symmetrical distribution of multiple images reflected from two mirrors inclined at an angle which is an aliquot part of 360°. The mirrors are placed in a tube parallel to the axis. One end of the tube is closed by



Kaleidoscope.

two pieces of ground glass, between which are loose bits of colored glass, capable of an indefinite number of arrangements. The patterns formed may be viewed by looking in at the other end of the tube.

**Kalevala.** Ancient Finnish epic, put into shape by Elias Lönnrot 1835, tr. by J. M. Crawford 1888. The measure is that of *Hiawatha*. The 2d ed., 1849, has 50 cantos and 22,805 lines.

**Kalevipoeg.** Esthonian epic, collected by Kreutzwald 1857–59.

**Kalgan.** Town of China, by the Great Wall, 120 m. n. of Peking. Pop. ab. 80,000.

**Kali.** Goddess of the Hindu pantheon, one of the forms of Prithivî; personification of Earth, and wife of Çiva. She typifies the destructive principle, and is frequently represented with eight arms, holding a trident, serpent, sword, and other emblems.

**Kâlidâsa,** probably 6th century. Dramatic and epic poet of India. His most important work, *Sakuntala*, was tr. 1789.

**Kalinite.** $KAl(SO_4)_2.12H_2O$. Mineralogical name for common potash alum when found in nature. See ALUMS.

**Kalisch,** DAVID, 1820–1872. Founder of *Kladderadatsch*, Berlin, 1848, and writer of farces.

**Kalisch,** MARCUS, 1825–1885. German Jew, settled in England 1849; author of a Hebrew grammar, 1863, and commentaries.

**Kalisz.** Town of Russian Poland, 132 m. w. of Warsaw; scene of a defeat of Swedes by Poles Oct. 29, 1706, and of French by Russians Feb. 13, 1813. Pop., 1891, 20,280.

**Kalkbrenner,** FRIEDRICH WILHELM MICHAEL, 1788–1849. German pianoforte virtuoso and teacher, pupil of the Paris Conservatoire and Clementi; composer of many pieces, chiefly salon music.

**Kalliwoda,** JOHANNES WENZESLAUS, 1801–1866. Bohemian violin virtuoso and composer of symphonies, overtures, violin solos, and pianoforte pieces.

**Kalm,** PETER, 1715–1779. Prof. Abo, Finland. *En Resa til Norra America*, 1753–61; *Wästgötha och Bahnsländska Resa förrättad ar*, 1746; *Norra Americanska färge-örter*, 1763.

**Kalmar.** Old town of s. e. Sweden, on an island in the Baltic. Here the Union was signed July 20, 1397, uniting Sweden with Norway and Denmark under Queen Margaret. Pop., 1891, 11,772.

**Kalmucks.** See MONGOLIANS and CALMUCKS.

**Kalousek,** JOSEF, b. 1838. Prof. Prague; writer on Bohemian history and constitutional law.

**Kalsomining.** Coating for the walls of rooms, consisting of glue and Paris White, which gives a smooth finish.

**Kambalu.** Capital of China 1234–1368.

**Kamchatka.** Peninsula of n. e. Asia, projecting s. into the Pacific. Its climate is severe, owing to its mountainous character and to the polar winds which sweep it. The Kamchadales, occupying its s. part, are thick-set, dress in skins,

Kamchatka.

and live in underground houses in winter. They are friendly, but lazy, dirty, gluttonous, and polygamous. Their religion is Shamanism. The dead are thrown to the dogs. Annexed by Russia 17th cent. Pop. 6,500.

**Kamehameha I.,** d. 1819. First King of the Sandwich Islands 1811.—II., his son, d. 1824.—III., 1814–1854; King 1833; educated by missionaries; maker of laws and treaties.—IV., 1834–1863; King 1854.—V., 1830–1872; King 1863; reactionary.

**Kameke,** GEORG ARNOLD KARL VON, b. 1817. Prussian Major-gen. 1865, prominent in the wars with Austria and France.

**Kamenetz-Podolok.** Town of Podolia, s. w. Russia;

Kamenetz-Podolok—The Old Fortress.

taken by Mongols 1240, by Turks 1672; held again by Poland 1699–1795. Pop., 1890, 36,630, largely Jewish.

**Kames,** HENRY HOME, LORD, 1696–1782. Scottish judge and author. *Elements of Criticism*, 1762.

**Kames.** See GLACIER.

**Kami.** Gods of the Japanese Shinto pantheon. The first is entitled the Deity Master-of-the-August Center of Heaven. Their genealogy is given in the Kojiki. They are estimated to number 80,000.

**Kampen,** NIKOLAAS GODFRIED VAN, 1776–1839. Dutch historian, prof. Leyden 1816.

**Kämpfer,** ENGELBERT, 1651–1716. German traveler in Asia. *Hist. Japan and Siam*, tr. 1727.

**Kampti.** City of British India, 8 m. n. e. of Nágpur. Established (1821) around an English cantonment, it has become the most important city of the central provinces. Pop., 1891, 43,200.

**Kanagawa.** Seaport of Japan, on the island of Nippon, 15 m. s. of Tokio. Pop., 1892, 16,300.

**Kanakas.** Natives of Polynesia.

**Kanaris,** CONSTANTINE, 1790–1877. Greek patriot, leader of naval exploits against the Turks 1822–27; Senator 1847; Minister of Marine 1854–55.

**Kanawha,** or GREAT KANAWHA. Branch of the Ohio. It heads, as New R., in the mountains of n.w. N. C., flows n. across s.w. Va., then, assuming the name of Kanawha, flows n.w. across W. Va. Drainage area 11,630 sq. m.

**Kanazawa.** Town of Japan, on w. coast of Nippon. Pop., 1891, 97,653.

**Kandahar.** See CANDAHAR.

**Kane,** ELISHA KENT, M.D., 1820–1857. American Arctic explorer, who in 1850 went as surgeon of the first Grinnell expedition, and in 1853 as commander of a second, in which he achieved important results. He pub. accounts of both 1854–56.

**Kane,** SIR ROBERT, LL.D., F.R.S., 1810–1890. Irish chemist, knighted 1846. *Elements of Chemistry*, 1842; *Resources of Ireland*, 1844.

**Kangaroo.** Tribe of Marsupials of Australasia, comprising several genera and many species, characterized by the dental formula $i\frac{3}{1}, c\frac{0}{0}, p\frac{1}{1}, m\frac{4}{4}$. The innermost toes of hind feet are absent, the second and third reduced, the fourth greatly enlarged. They have strong claws. The hind limbs and tail are strongly developed, the forelimbs are small and not used when the animal is fleeing. Progression consists in a series of

The Great Kangaroo (*Macropus giganteus*).

hops. The Great Kangaroo (*Macropus major*), may attain a ht. of 7 ft. when sitting; it can clear 20 ft. at a bound. It usually feeds in flocks; it is timid and easily alarmed, but a powerful fighter when cornered. The color is yellowish brown. It is now much reduced in numbers. One species of Kangaroo resembles a hare, another a rat. Some live on the plains, some in forests, some on the rocks.

**Kanhoo.** Chinese card game, recently introduced into England; played in China with cards bearing money suit marks from which W. H. Wilkinson claims European cards were derived. Though the games are the same, there is no historical evidence of the introduction of Chinese cards into Europe.

**Kanjour.** Collection of sacred books of Thibetan Buddhism. It contains 108 works, corresponding with the number of beads upon the Buddhist rosary, while the other collection, the Tanjour, contains 220. Following the doctrines of the Mahayana school, they are largely devoted to magic, mysticism, and divination.

**Kansas.** One of the Central States. Its area is 82,080 sq. miles. Its surface consists of undulating prairies, merging toward the west into semi-arid plains. Its rivers are the Missouri, which flows a short distance on its e. boundary, and is navigable, the Kansas, and the Arkansas, neither of which is navigable to any extent. The Neocene area, which covers so large a portion of Nebraska, extends down into K., and is succeeded s. e. by a large area of Cretaceous, while the Carboniferous formation occupies the s. e. part, covering nearly one-half of its area. Its industries, as in the other States in its vicinity, relate almost entirely to agriculture, the culture of the cereals being of greatest importance. In 1890 the value of farms and farming machinery was $578,595,836, and the value

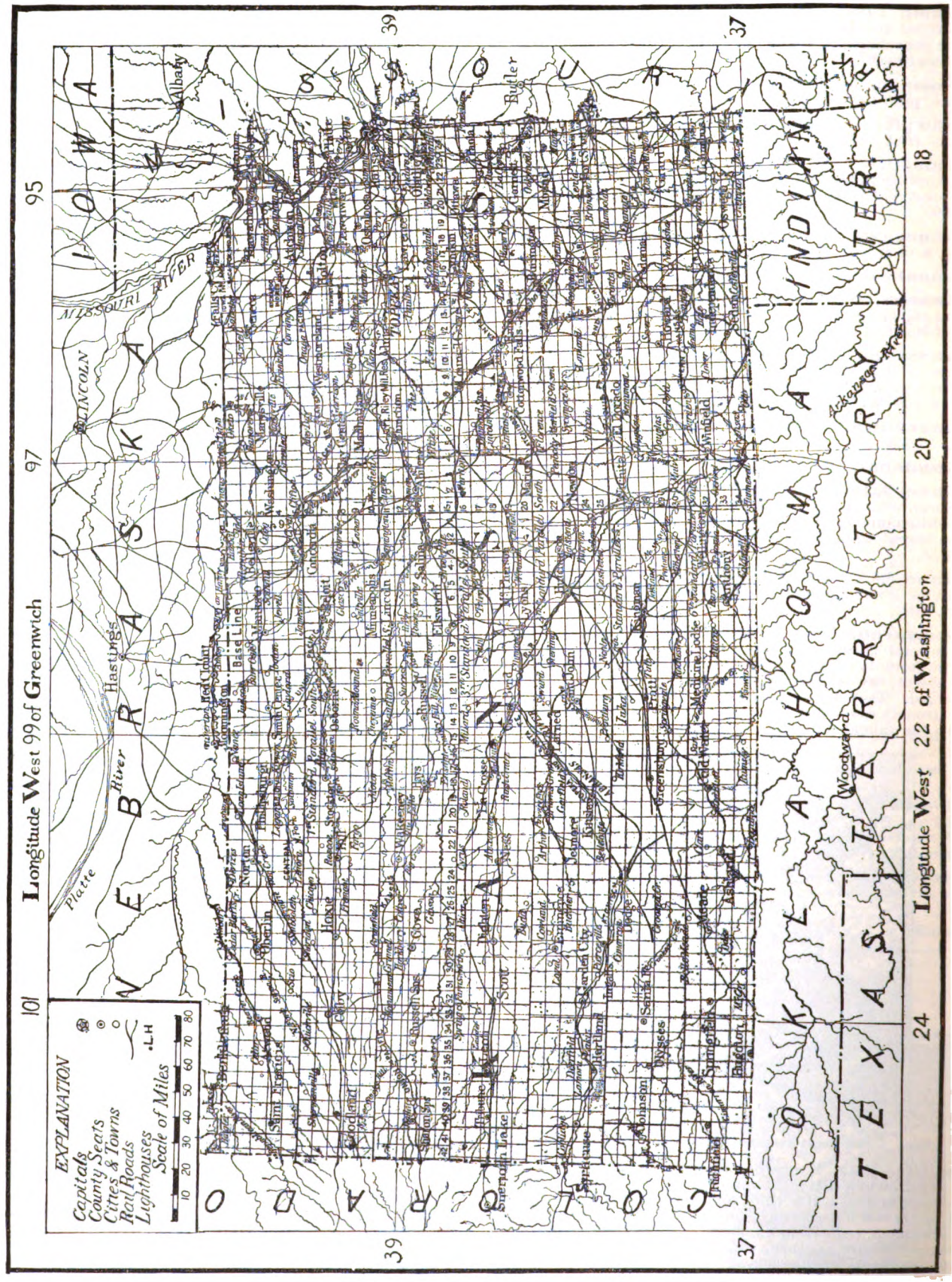
The Kansas Whirlwinds.

of the product, 1889, $95,070,080. The mineral resources consist chiefly of coal, of which, in 1893, 2,590,700 tons were mined. It has a large and increasing railroad system. There were, in 1893, 8,900 m. in operation. The capital is Topeka. K. came into possession of the U. S. as a part of the Louisiana purchase. It was organized as a territory and opened for settlement in 1854, and has acquired a special interest in the history of the nation on account of its relation to the slavery question. The defenders and opposers of slavery made it the battleground of their opinions, each striving for the control of the State. Societies representing both parties were organized, and rival Legislatures contested the supremacy with each other. The Constitution of 1855 prohibited slavery; that of 1857 sanctioned it: that of 1859 again prohibited it. It was finally admitted into the Union, 1861, and took an active part in the suppression of the Rebellion. Pop., 1890, 1,427,096; density, 17 per sq. m. (See Map, p. 424.)

**Kansas City.** Capital of Wyandotte co., Kan., on the Missouri and Kansas R., in the e. part of the State; formed 1886 by the consolidation of Wyandotte, Kansas City, and Armourdale. Pop., 1890, 38,316.

**Kansas City.** In Jackson co., Mo., on the right bank of the Missouri R., at the mouth of the Kansas, on the w. boundary of the State. It is an important railroad center, having 11 lines, radiating in all directions. It is supplied with water by the Holly system, and is thoroughly sewered. Among its industries slaughtering and meat packing is most prominent. Pop., 1890, 132,416.

**Kansas** (or KAW) **River.** Right-hand branch of the


EXPLANATION
Capitals
County Seats
Cities & Towns
Rail Roads
Lighthouses
Scale of Miles
10 20 30 40 50 60 70 80
Longitude West 99 of Greenwich
Longitude West 22 of Washington
101
97
95
24
20
18
39
37
NEBRASKA
IOWA
MISSOURI
KANSAS
OKLAHOMA
TEXAS
COLORADO
INDIAN TERRITORY
MISSOURI RIVER
Platte River
Arkansas River
Hastings
LINCOLN
Albany
Butler
Woodward
Red Cloud
Franklin
Base Line
Sherman Lake
Salina
Russell
Dodge
Ellsworth
Stanford
Wilkeney
Hoxie
Norton
Concordia
Minneapolis
Lincoln
Ottawa
Garnett
Iola
Humboldt
Chanute
Independence
Coffeyville
Cedarvale
Winfield
Arkansas City
Medicine Lodge
Greensburg
Kinsley
Ashland
Meade
Liberal
Springfield
Elkhart
Ulysses
Johnson
Sublette
Garden City
Dodge
Cimarron
Tulsa
Muskogee
Fort Smith
Ada
Sherman
Denison
Durant
Paris
Bonham
Clarksville
Texarkana
Sulphur Springs
Greenville
Mineola
Longview
Tyler
Jacksonville
Palestine
Nacogdoches
Lufkin
Crockett
Huntsville
Corsicana
Waco
Temple
Cuero
Victoria
Beeville
Alice
Corpus Christi
Kingsville
Laredo
Eagle Pass
Del Rio
Uvalde
Brownsville
Galveston
Houston
Beaumont
Port Arthur
Orange
Lake Charles
Shreveport
Alexandria
Natchitoches
Monroe
Vicksburg
Jackson
Meridian
Tuscaloosa
Birmingham
Anniston
Montgomery
Selma
Mobile
Pensacola
Tallahassee
Jacksonville
Savannah
Charleston
Wilmington
Raleigh
Norfolk
Richmond
Washington
Baltimore
Philadelphia
Trenton
New York
Boston
Providence
Hartford
New Haven
Albany
Buffalo
Rochester
Syracuse
Utica
Scranton
Harrisburg
Pittsburgh
Cleveland
Toledo
Detroit
Lansing
Grand Rapids
Chicago
Milwaukee
Madison
Green Bay
Duluth
Minneapolis
St. Paul
Des Moines
Cedar Rapids
Davenport
Dubuque
Sioux City
Omaha
Lincoln
Cheyenne
Denver
Pueblo
Colorado Springs
Salt Lake City
Ogden
Cheyenne
Helena
Butte
Great Falls
Spokane
Portland
Seattle
Tacoma
San Francisco
Los Angeles
San Diego
Phoenix
Tucson
Santa Fe
Albuquerque
Las Vegas
Reno
Carson City
Boise
Pocatello
Salt Lake City
Cheyenne
Denver
Pueblo
Colorado Springs
Salt Lake City
Ogden
Cheyenne
Helena
Butte
Great Falls
Spokane
Portland
Seattle
Tacoma
San Francisco
Los Angeles
San Diego
Phoenix
Tucson
Santa Fe
Albuquerque
Las Vegas
Reno
Carson City
Boise
Pocatello

Missouri. It heads in e. Col. and flows generally e. Its mouth is at Kansas City, Mo. Length ab. 550 m.; drainage area 59,757 sq. m.; mean flow 2,700 cubic ft. per second.

**Kansas,** UNIVERSITY OF. Founded 1864 at Lawrence, Kan., is sustained by funds supplied by U. S. Land Grant of Jan. 1861. It admits both sexes to each of its five departments, Arts, Law, Engineering, Pharmacy, and Fine Arts, provides a first-year course in medicine, and sustains courses of University-extension lectures. It had, in 1895, 30 professors, with 16 assistants and 7 law lecturers, 875 students, of whom 426 were in arts, 99 in law, and 100 in engineering, and a library of ab. 23,000 vols.

**Kant,** IMMANUEL, 1724–1804. Greatest of German philosophers, prof. Königsberg 1770–97; founder of transcendental idealism, which was designed to refute the skepticism of Hume and the sensationalism of Locke, while correcting the dualism of Descartes. His knowledge was equally profound in Physical Geography and Anthropology; he anticipated La Place in proposing the nebular hypothesis regarding the origin of the solar system. His chief work was in the field of philosophy, which he revolutionized by his theory of the ideality of space and time, his categories of the understanding (organic or constitutional functions of the mind), and his agnostic conclusions regarding the incapacity of speculative reason, on the ground of the distinction between phenomena and things in themselves,

Immanuel Kant.

for proving the Existence of God, Immortality, and the Freedom of the Will. His Ethics, however, provided a moral argument for these ideas, the fact of the categorical imperative, or sense of duty, being assumed to prove freedom, the need of an infinite time, in order to realize the ideal connection between happiness and virtue, being assumed to prove immortality, and the need of God's existence in order to make this ideal connection actual, being assumed to prove the fact of that existence. Chief works: *Critik der reinen Vernunft*, 1781; *Critik der practischen Vernunft*, 1788; and *Prolegomena zur jeden kunftigen Metaphysik*, 1786.

**Kantemir,** ANTIOKH, PRINCE, 1708–1744. Russian poet, satirist, and translator, Ambassador to England and France.

**Kaolin.** Pure form of aluminium silicate. Its composition usually corresponds to $Al_2(SiO_3)_3,Al_2O_3.2H_2O$. It is used for making porcelain.

**Kaolinite.** $Al_2O_3,2SiO_2.2H_2O$. Hydrous aluminium silicate, resulting from the decomposition of feldspathic rocks. It occurs in soft, compact, friable, or mealy masses as an independent mineral, but more commonly as the essential ingredient of clay, in which it is associated with more or less sand, iron oxide, and other matter of various kinds.

**Kapnist,** VASILI, 1757–1824. Russian dramatist and poet.

**Kapolna.** In Hungary; scene of an Austrian victory over Hungarians, Feb. 26–27, 1849.

**Kappel,** or CAPPEL. In Switzerland; scene of a defeat of Protestants and death of Zwingli, Oct. 11, 1531.

**Karachi,** or KURRACHEE. Seaport of w. India, on the Arabian Sea, near the frontier. Pop., 1891, 105,199.

**Karadzic,** VUK STEFANOVIC, 1787–1864. Author of a Servian grammar and dictionary, collector of folk-songs, proverbs, and tales.

**Kara George.** See CZERNY.

**Karaites.** Small body of Oriental and anti-Talmudic Jews, founded in Palestine ab. 760 by Anan ben David.

**Karakorum Range.** In s. Asia, traversing the plateau of Thibet from near Lassa w. to its junction with the Hindu Kush in long. 73° E. Its altitude exceeds 20,000 ft., and few of the passes are below 18,000 ft. Its highest peak is Dapsang, 28,278 ft. The limit of perpetual snow is at ab. 19,000 ft.; it contains immense glaciers.

**Karamzin,** NIKOLAI MIKHAILOVICH, 1765–1826. Russian historian and journalist. His novels, poems, and *Letters of a Traveler*, 6 vols., 1797–1801, were popular; his *History of Russia*, 12 vols., 1816–29, is still of value, though it extends only to 1612 and is slavishly conservative in tone.

**Karéns.** Remnant of a semi-Mongolian race, including perhaps Caucasian elements, driven by their enemies into the mountain retreats of n. Siam and e. Burmah. They were almost agnostic in religion, but possessed legends strangely like the stories of Genesis. Christian, especially Baptist, missionaries have rapidly converted nearly all. 23,804 church members in 1884.

**Karikal.** French district in s. e. India on the Caromandel coast; acquired 1738. Area 53 sq. m.; pop., 1891, 70,500.

**Karl August.** See WEIMAR.

**Karlowitz.** See CARLOWITZ.

**Karlsbad.** See CARLSBAD.

**Karma.** In Buddhist theology, force, action; sum of good and bad deeds in a life, determining one's fate after death. Theosophists use the term to express a similar concept.

**Karmathians.** Mohammedan sect in Arabia, powerful and destructive in 10th century. They took Mecca 930.

**Karnak.** Part of the ruins of ancient Thebes. Here was a temple complex, whose most splendid feature is the Great

Karnak.

Hall, built by Seti I. and Rameses II., ab. 1400–1300 B.C. The ruins are the most extensive collection in the world. See HYPOSTYLE.

**Karnovich,** EUGENI PETROVICH, b. 1823. Russian novelist and historical writer.

**Karpinski,** FRANCISZEK, 1741–1825. Polish poet.

**Karr,** JEAN BAPTISTE ALPHONSE, 1808–1890. French novelist; ed. *Figaro*, 1839. *Genevieve*, 1838; *Journey Round My Garden*, 1845; *Les Guêpes*, 1853–57.

**Karroo.** Tableland of Cape Colony, mainly barren from lack of irrigation.

**Kars.** Town of Armenia, taken from Turks by Russians 1828, 1855, and 1877; ceded to Russia 1878.

**Karsten,** CARL JOHANN BERNARD, 1782–1853. German promoter of the arts of mining and metallurgy. *System der Metallurgie*, 5 vols., 1831–32.

**Karsten,** HERMANN GUSTAV KARL WILHELM, b. 1817. Prof. Vienna. *Die Vegetationsorgane der Palmen*, 1847; *Floræ Columbiæ*, 1858–69; *Das Geschlechtsleben der Pflanzen und die Parthenogenesis*, 1860; *Anatomie und Physiologie der Pflanzen*, 1865–67; *Chemismus der Pflanzenzelle*, 1869.

**Karyokinesis.** Series of changes which the nucleus of plant or animal cells undergo in cell-division. See INDIRECT CELL-DIVISION.

**Karyolysis.** Partial or complete destruction of the nucleus of plant or animal cells; phenomena of Karyokinesis.

**Karyosoma.** Primary segments or parts of the nucleolus formed during indirect cell-division.

**Kashan.** City of Persia, 92 m. n. of Ispahan, noted for manufactures of silks, brocade, carpets, and tiles. Pop. ab. 70,000.

**Kashgar.** Capital of e. Turkestan, on a branch of the Tarim: held by China 1758–1864 and since 1879. The new town, built 1838, is the chief of its two ports. It has some manufactures and much trade with Russia. Pop. ab. 120,000.

**Kashkar,** or CHITRAL. State of n. India, long tributary to China, now held by the British, who subdued a rebellion 1895. Pop. ab. 200,000.

**Kashmir.** British Indian State between 32° 30′ and 36° N. lat., and 73° 30′ and 76° E. long. It consists of beautiful elevated valleys and certain of the Himalaya Mountains, upon whose slopes wander the famous Kashmir goats. The State

Valley of the Jhelum, Kashmir Hills.

was conquered by Emperor Akbar 1586 and became a part of the Mogul Empire. The Sikhs took possession 1819, and have nominally held it ever since, although Ghulab Singh in 1846 recognized England's supremacy only to be confirmed in power as feudatory ruler.

**Kaskaskia.** Village of Randolf co., Ill., settled by the French 1682, occupied by the British 1778, and taken by Ky. recruits under Col. Geo. R. Clark July 4, 1778. Pop., 1890, 862.

**Kasson,** JOHN ADAMS, LL.D., b. 1822. M. C. from Iowa 1863–67, 1873–77, and 1881–84; Minister to Austria 1877–81, and to Germany 1884–85.

**Katabolic,** or CATABOLIC. In animal and plant physiology, type of destructive metabolism, in which complex chemical compounds are broken up into simpler ones.

**Katahdin.** Highest mountain in Me.; 5,385 ft. high.

**Katadioptric.** Term applied to those optical instruments in which the light rays are both reflected and refracted, as in certain lighthouse systems.

**Katakinesis.** See INDIRECT CELL-DIVISION.

**Kataphase.** See INDIRECT CELL-DIVISION.

**Kataplastic Development.** Ontogeny resulting in degeneration, as in most parasites; *e.g.*, Barnacles and Copepods. Such degeneration must be treated as a form of advanced development, just as if the change had been an anaplastic one.

**Kater,** HENRY, F.R.S., 1777–1835. English physicist, in India 1796–1808; inventor of the floating collimator to determine horizontal or zenith points, and of a pendulum to measure the force of gravity.

**Kater's Pendulum.** Reversible pendulum, to which the principle of Huyghens is applied. At O and O¹, the center of suspension and center of oscillation respectively, knife-edges are fixed, turned toward each other. Between these are two sliding weights, by the adjustment of which in a series of trials O and O¹ may be made accurately to coincide with the knife-edges. The value of g may then be calculated from the formula $T=2\pi\sqrt{\frac{l}{g}}$ or $g=\frac{4\pi^2 l}{T^2}$, in which $l=O\,O^1$. From many experiments with the pendulum at different points the form and density of the earth may be studied.

**Kathay.** See CATHAY.

**Kathion.** See ELECTRODE.

**Kathode.** See ELECTRODE.

**Katkoff,** MICHAEL NIKIFOROVICH, 1818–1887. Russian journalist, who from 1861 wielded vast influence through the Moscow *Gazette*. At first a Liberal, he was, after 1863, narrowly national and intensely absolutist.

**Katoptrics.** Part of optics treating of reflection and the laws of reflected light.

**Katrine,** LOCH. Lake in Perthshire, Scot., noted for its beauty as well as for its depth and purity of water; celebrated

Loch Katrine—Ellen's Island, as seen from the Silver Strand.

by Scott and Wordsworth; source of Glasgow's water supply since 1859. Length 8 m., area 3,119 acres.

**Kattegat.** See CATTEGAT.

**Katun.** Mayan Indian word meaning "things arranged in rows," as soldiers: applied by French writers, beginning with Baron Waldeck, as a name for Mayan hieroglyphic writing.

**Katydid.** See LOCUSTIDÆ.

**Katzbach,** BATTLE OF THE. In Silesia, Aug. 26, 1813; decisive victory gained by Blücher over the French under Macdonald.

**Kauffmann,** ANGELICA, 1741–1807. Swiss portrait-painter, active in Italy and England; best representative of the German art of her time.

**Kaufmann,** CONSTANTINE VON, 1818–1882. Russian general, eminent for Asiatic conquests; gov. of Turkestan 1867; victorious at Samarcand 1868, Khiva 1873, and Merv 1880.

**Kaulbach,** WILHELM VON, 1805–1874. German painter, active in Munich and Berlin. His best works are the historical frescoes on the great staircase of the Berlin Museum, the *Battle of the Huns*, etc., and decorative pieces in Munich. He is especially distinguished as a book-illustrator.—His son, HERMANN, b. 1846, and great-nephew, FRIEDRICH AUGUST, b. 1850, are noted painters.

**Kaunitz,** WENZEL ANTON, PRINCE VON, COUNT OF RIETBERG, 1711–1794. Austrian statesman, prominent at the Congress of Aix-la-Chapelle, 1748; Chancellor 1753–92.

**Kautz,** AUGUST VALENTINE, U.S.A., 1828–1895. Brig.-gen. Vols. 1864; prominent in the taking of Petersburg and Richmond, Va.

**Kavanagh,** JULIA, 1824–1877. Irish novelist, who lived mostly in France and usually took French subjects. *Madeleine*, 1848; *Women of Christianity*, 1852; *Silvia*, 1870.

**Kavelin,** CONSTANTIN DMITRIEVICH, 1818–1886. Russian official and writer on law.

**Kay,** JOHN, 1742–1826. Scottish caricaturist. *Portraits*, 1838–77.

**Kaye,** JOHN, D.D., 1783–1853. Bp. of Bristol 1820, and Lincoln 1827. He wrote much on Ch. history and Fathers prior to 300.

**Kaye,** SIR JOHN WILLIAM, 1814–1876. English historian of the Afghan and Sepoy wars, and of the East India Co.

**Kazan.** City of e. Russia, on the Kazanka, near its junction with the Volga; built ab. 1450; capital of a Mongol state

Kazan—The Kremlin.

till 1552, when Ivan took it. Its Univ., founded 1804, had in 1895, 825 students. Pop., 1891, 134,359.

**Kazinczy,** FRANZ, 1759–1831. Hungarian writer and translator; imprisoned 1793–1801.

**Kean,** EDMUND, 1787–1833. English actor of genius, prominent in London 1814–25, and unsurpassed in Shakespearian tragedy.—His son, CHARLES JOHN, 1811–1868, manager of the Princess' Theater in London 1850–59, took the same parts with good success though inferior ability, and was best in melodrama.—His wife, ELLEN TREE, d. 1880, was a noted actress.

**Keane,** JOHN JOSEPH, D.D., b. 1839 in Ireland. Bp. of Richmond, Va., 1878; rector Catholic Univ. at Washington 1888.

**Kearny,** PHILIP, 1815–1862. Officer U.S.A. 1837–51, serving in Mexico 1846–47, and with the French in Africa 1839–40, and in Italy 1859; Brig.-gen. U. S. Vols. 1861; prominent in the Va. battles; Major-gen. 1862; killed at Chantilly Sept. 1; called by Gen. Scott "the bravest man I ever knew, and the most perfect soldier."—His uncle, STEPHEN WATTS, U.S.A., 1794–1848, was a Brig.-gen. in the Mexican War, and conquered New Mexico 1846. —His cousin, LAWRENCE, U.S.N., 1789–1868, became Captain 1832 and Commodore 1867.

**Kearsarge.** Vessel with which Capt. Winslow, U.S.N., after an hour's action, sunk the *Alabama*, commanded by Capt. Semmes, C.S.N., off Cherbourg, June 19, 1864.

**Keary,** ANNIE MARIA, 1825–1879. English novelist and historical writer. *Castle Daly*, 1875; *Early Egypt*; *Nations Around*, 1870; *A Doubting Heart*, 1878.

**Keating,** JOHN M., M.D., b. 1852. Prof. Phila.; writer on diseases of children.

**Keats,** JOHN, 1795–1821. English poet, whose *Endymion*, 1818, was savagely attacked by the *Quarterly Review*. His fame rests mainly on his later pieces. He was a master of melody: perhaps no other poet at so early an age ever gave so much of promise and performance. His memory has of late received deserved and especial honors.

**Keber's Organ.** Mass of tissue surrounding the intestine in Mollusks, where it enters the body cavity or pericardium.

**Keble,** JOHN, 1792–1866. Prof. of Poetry at Oxford 1831–41, Vicar of Hursley 1836; prominent in the Tractarian movement; ed. of Hooker's works 1836; author of 8 of the Tracts for the Times. Of his *Christian Year*, 1827, near 500,000 copies were sold. *Psalter*, 1839; *Lyra Innocentium*, 1846; *Poems*, 1869. His *Sun of My Soul* is among the most valued English hymns.

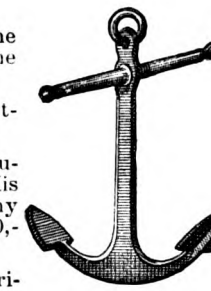
**Kecskemet.** City of Hungary 55 m. by rail s. e. of Budapest. Its annual cattle fair is the chief one of the country. Pop., 1890, 48,493.

**Kedge.** Small anchor.

**Keel.** Principal piece of timber at the bottom of a ship usually first laid on the blocks in building.

**Keel.** Projecting ridge of the breastbone in birds. See CARINA.

**Keeley,** LESLIE E., M.D., b. 1836. Author of the gold-cure for inebriates. His first institute was opened 1880; many branches exist and have treated some 250,000 cases.



Kedge Anchor.

**Keely,** JOHN WORRALL, b. 1837. American discoverer of a mysterious "motor" or force, which is still imperfectly developed, though 24 years of labor and some $500,000 have been expended upon it.

**Keen,** WILLIAM WILLIAMS, M.D., LL.D., b. 1837. Prof. Jefferson Coll. 1889; writer on surgery.

**Keenan,** HENRY FRANCIS, b. 1849. American novelist. *Trajan*, 1884; *The Aliens*, 1886.

**Keene,** CHARLES SAMUEL, 1823–1891. English artist, known since 1851 by his pictures in *Punch*, and in less degree as illustrator of *Mrs. Caudle* and other books.

**Keene,** LAURA (MARY MOSS), 1820–1873. Anglo-American actress and manager.

**Keep.** Central and best defended part of an English feudal castle. It is commonly a massive tower, rectangular or round. The basement (donjon-keep) was used for a prison and storehouse. An intermediate story contained the guard-room, and above this was the hall, which fulfilled all the purposes divided, in modern buildings, among the dining-room or banquet-hall, the drawing-room and the ball-room. Sometimes this apartment was divided by columns into a nave and suites, sometimes open from wall to wall. The keep was separated from the outworks by a moat, furnished with a drawbridge, and was intended to stand a siege even after the outworks had been captured and destroyed.

**Keeper.** See ARMATURE.

**Keeps,** or KEPS. Catches or rests to support a cage at the mouth of a shaft or other landing-place.

**Keeve.** Large tub or vat for tossing or tozing ore in ore-dressing.

**Kehrer,** FERDINAND ADOLF, b. 1837. Prof. Giessen 1872, Heidelberg 1881; writer on obstetrics.

**Keightley,** THOMAS, 1789–1872. Irish maker of text-books. *Fairy Mythology*, 1850.

**Keil,** JOHANN CARL FRIEDRICH, D.D., 1807–1888. Prof. Dorpat 1838–59; O. T. commentator.

**Keim,** CARL THEODOR, D.D., 1825–1878. Prof. Zurich 1860 and Geissen 1873; a devout and able rationalist, whose long study of N. T. origins culminated in *Jesus of Nazareth*, 1867–72, tr. 6 vols. 1873–82.

**Keiser,** REINHARD, 1674–1739. Composer of 116 operas for the first German opera at Hamburg, where he was director while Handel was in the orchestra.

**Keith,** ALEXANDER, D.D., 1791–1880. Scottish author. His *Evidence from Prophecy*, 1824, was long popular.

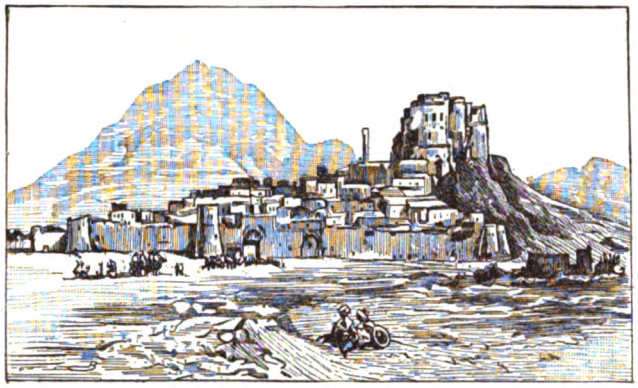
**Keith,** GEORGE, 1638–1716. Scottish Quaker, founder of a sect, then an Anglican; missionary in America 1702–4. Among his works is an answer, 1702, to Barclay's *Apology*.

**Keith,** GEORGE KEITH ELPHINSTONE, VISCOUNT, R.N., 1746–1823. Admiral 1795; active against the Americans, French, and Dutch; Baron 1797, for adding to the British Empire Capetown, Ceylon, and other possessions; Viscount 1814.

**Keith,** JAMES, 1696–1758. Scottish soldier in the service of Spain 1719–28, and Russia 1728–47; Prussian Field-Marshal 1747; killed at Hochkirch.

**Kekule,** FRIEDRICH AUGUST, b. 1829. Prof. of Chemistry at Ghent 1858, and Bonn 1865; author of the Benzene hypothesis. *Lehrbuch der organischen Chemie*, 1861–67.

**Kelat,** or KHELAT. Fortified town, capital of Beluchistan, occupied by the British 1839–41, acquired 1888. It is built in



Kelat.

terraces with mud walls. It is at an elevation of ab. 6,780 ft. and its importance is merely military. Pop. ab. 14,000.

**Kelati Nadiri.** In Persia, near the Russian frontier, a strong and important fortress.

**Keller,** GOTTFRIED, 1819–1890. Swiss novelist and poet.

**Kellermann,** FRANÇOIS CHRISTOPHE, 1735–1820. French general, made Marshal and Duke of Valmy 1816.

**Kelley,** WILLIAM DARRAH, 1814–1890. Judge of Common Pleas, Phila., 1846–56; M.C. from 1861; champion of Protection. *Letters*, 1872–80.

**Kellogg,** CLARA LOUISE (MRS. CARL STRAKOSCH), b. 1842. American prima donna soprano. She made her operatic debut in New York 1861, and in London 1867. Her active career covered a quarter of a century.

**Kellogg,** SAMUEL HENRY, D.D., b.1839 in N.Y. Missionary in India 1865–76 and 1892; prof. Alleghany, Pa., 1879–86. *Hindi Grammar*, 1876–92; *Leviticus*, 1891.

**Kellogg,** WILLIAM PITT, b. 1831. Collector of New Orleans 1865; U. S. Senator from La. 1868–71 and 1877–83; Gov. of La. 1873–77, maintained by U. S. authority against violent opposition; impeached 1876; M.C. 1883–85.

**Kelly,** THOMAS, 1769–1854. Irish evangelist; author of 765 hymns, many of them widely used.

**Kelly,** WILLIAM, 1811–1888. American inventor of the air-boiling process in iron manufacture, antedating Bessemer.

**Kelly's Ford.** In Va.; scene of an action Nov. 7, 1863.

**Kelp.** Large, olive-green seaweeds, or coal obtained by charring them; used in the manufacture of iodine and soda salts.

**Kelson.** Timber laid on the floor timbers immediately over the keel, and running lengthwise of the vessel.

**Kelts.** See CELTS.

**Kemble,** JOHN MITCHELL, 1807–1857. Son of Charles; ed. *British and Foreign Review*, 1835–44; tr. Beowulf 1837. *Hist. Saxons in England*, 1849.

**Kemble,** JOHN PHILIP, 1757–1823. English tragic actor of high rank, specially eminent as Brutus, Coriolanus, and Cato; manager of Covent Garden 1802, retired 1817.—Of his brothers, GEORGE STEPHEN, 1758–1822, was notable as Falstaff, and CHARLES, 1775–1854, was excellent in comedy.—Of their sisters, MRS. SARAH SIDDONS (q.v.) is famous, and MRS. ELIZABETH WHITLOCK, 1761–1836, was long in the U. S.—Two daughters of Charles kept up the family fame. FRANCES ANNE (MRS. BUTLER), 1809–1893, retired 1834, but gave readings in America after 1848, and pub. poems and journals. ADELAIDE (MRS. SARTORIS), b. 1814, retired 1843, wrote *A Week in a French Country House*, 1867, and *Medusa*, etc., 1868.

**Kemény,** SIEGMUND, BARON, 1816–1875. Hungarian author and journalist. *Studies*, 1870.

**Kemp,** GEORGE MEIKLE, 1795–1844. Designer of Sir W. Scott's monument at Edinburgh.

**Kemp,** JOHN, 1380–1454. Bp. of London 1421, Abp. of York 1426, Abp. of Canterbury 1452; Chancellor 1426–32 and 1450.

**Kempelen,** WOLFGANG, FREIHERR VON, 1734–1804. Austrian poet and official; inventor of the automaton chess-player 1769, exposed 1845; it concealed a man.

**Kempenfeldt,** RICHARD, R.N., 1718–1782. Captain 1757, Admiral 1780; drowned at Spithead with some 900 men by the sinking of the *Royal George*, Aug. 29, 1782. *Hymns and Poems*, 1777.

**Kemper,** JACKSON, D.D., LL.D., 1789–1870. P. E. Bp. of the Northwest from 1835. He laid the foundations of what are now 8 dioceses.

**Kempis,** THOMAS À, 1380–1471. German Augustinian monk, supposed author of the *Imitation of Christ*, most popular of devotional books.

**Ken.** Fist and finger games, popular in Japan. The Italian game of Morra is a type. Many varieties exist, of which Tohachi Ken is the most popular. In winter regular matches are held in Tokio, attended by formalities similar to those of the wrestling contests.

**Ken,** THOMAS, D.D., 1637–1711. Bp. of Bath and Wells 1684; imprisoned by James II. 1688, ejected as a nonjuror 1691. Of his poems, pub. in 4 vols. 1721, the most prized are the morning and evening hymns, which, with their doxology, are in universal use.

**Kendal,** WILLIAM HUNTER, b. 1843. English actor, with his wife, MARGARET (ROBERTSON), b. 1848, m. 1874, well known in America.

**Kendall,** AMOS, 1789–1869. American journalist, long influential at Washington; Postmaster-gen. 1835–40. *Life of Jackson*, 1843; *Autobiography*, 1872.

**Kendrick,** ASAHEL CLARK, D.D., LL.D., 1809–1895. Prof. Hamilton Coll. 1832, Univ. Rochester from 1850; N. T. reviser; editor of Greek text-books and N. T. commentaries.

**Kenealy,** EDWARD VAUGHAN HYDE, D.C.L., 1819–1880. Irish lawyer, poet, and journalist; defender of the Tichborne claimant 1873. M.P. 1875.

**Kenesaw Mountain.** In Georgia; scene of battles June 14, 17, 22, 27, and July 1, 1864. A general assault was made June 27, with Union loss of 2,500. Gen. Johnston was forced to retire July 1.

**Kenilworth.** Town in Warwickshire, noted for ruins, kept in fine preservation, of a castle built ab. 1125, in which Leicester

Kenilworth Castle.

entertained Elizabeth 1575; scene of Scott's romance. Here are also the remains of an abbey founded 1122. Pop., 1891, 4,173.

**Kenites.** Arab tribe, related and attached to Israel, though always nomadic. Moses' wife, Zipporah, was a Kenite.

**Kenna,** JOHN EDWARD, 1848–1893. M.C. from W. Va. 1877–83; U. S. Senator from 1883.

**Kennan,** GEORGE, b.1845 in Ohio. After previous journeys in Siberia, he investigated the Russian exile system 1885–86, and exposed it in the *Century Magazine* 1889–90. These papers, collected 1891, made a profound sensation.

**Kennebec River.** In Maine. It heads in Moosehead Lake, flows s., and is navigable to Augusta. Length 155 m., drainage area 11,415 sq. m.

**Kennedy,** BASIL HALL, D.D., 1804–1889. Head-master of Shrewsbury School 1836–66; Prof. of Greek at Cambridge and Canon of Ely 1866; ed. of *Virgil*, 1876, of several Greek plays, and of Latin text-books. *Psalter in Verse*, 1860. His *Hymnologia Christiana*, 1863, is the largest of Anglican collections and contains many hymns of his own.

**Kennedy,** JOHN PENDLETON, LL.D., 1795–1870. M.C. 1839–45. Sec. Navy 1852–56; novelist. *Swallow Barn*, 1832; *Life of Wm. Wirt*, 1834; *Horseshoe Robinson*, 1835; *Rob of the Bowl*, 1838.

**Kennett,** WHITE, D.D., 1660–1728. Bp. of Peterborough 1718; a prolific writer, chiefly on historical topics.

**Kennicott,** BENJAMIN, D.D., 1718–1783. English editor of the Hebrew Bible 1776–80.

**Keno.** Gambling game like the Italian lotto, played by drawing numbered balls from a wheel. The players are each provided with cards bearing numbers in rows of five, and the one who first covers a row wins.

**Kenrick,** FRANCIS PATRICK, D.D., 1797–1863. R.C. Bp. of Phila. 1842; Abp. of Baltimore 1851. He pub. 7 vols. on dogmatic and moral theology, in Latin, 1839–43.—His brother, PETER RICHARD, D.D., 1806–1875, became Bp. of St. Louis 1843 and Abp. 1847.

**Kensett,** JOHN FREDERICK, 1816–1872. N.A. 1849. American landscape painter.

**Kensington.** Parish in the west of London. It adjoins Westminster, within which are Kensington Palace and Gardens. The Palace was bought by William III. from the successor of

Staircase in Kensington Palace.

Heneage Finch in 1689, and was the birthplace of Queen Victoria. Here are found the South Kensington Museum, Natural History Museum, Imperial Institute, and Holland House, erected 1607, once the home of William Penn. Pop., 1891, 166,321.

**Kent.** Early Jutish kingdom of England, on the coast, s. of the Thames; settled by Hengest 449; coterminous with the present county; subject to Wessex 823.

**Kent,** JAMES, LL.D., 1763–1847. Judge of N. Y. Sup. Ct. 1798–1804; Chief-justice 1804–14; Chancellor 1814–23; Prof. of Law in Columbia Coll. 1794–98 and 1824–47. *Commentaries on American Law*, 4 vols., 1826–30.

**Kent,** JOHN, 1766–1843. English hymnist.

**Kent,** WILLIAM, ab. 1685–1748. English artist, pioneer of landscape gardening.

**Kentigern,** ST., ab. 518–603. Scottish missionary in Wales.

**Kentish Language.** Dialect of Old English, still heard in survival among peasants of Kent, and characterized by the use of *z* for *s*, *v* for *f*, and other anomalies. In *vat* for the Old English *fæt*, the Kentish form has become national. The best example of literary Kentish is Dan Michel's *Ayenbite of Inwyt* (Remorse of Conscience), 1340.

**Kenton,** SIMON, 1755–1836. Pioneer in Ky., associated with D. Boone and G. R. Clark.

**Kent's Cavern.** In Devonshire, Eng., near Torquay. It attracted the attention of scientific men in 1825, although known at an earlier date. The results of the exploration were similar to those of BRIXHAM CAVE (q.v.). See ANTIQUITY OF MAN.

**Kentucky.** One of the s. Central States. Its area is 41,263 sq. m. The e. part consists of the slopes of the Cumberland plateau, which is heavily eroded into ridges and gorges. The remainder is undulating and without marked features. The n. boundary is the Ohio R.; the short w. boundary is the Mississippi. It is crossed by the Tennessee and Cumberland Rivers, which are navigable within the State, as is the Big Sandy, which forms part of the e. boundary. The smaller rivers, the Licking, Kentucky, and Green, are navigable for short distances. The geological structure is comparatively simple. Three-quarters of it, including all the Cumberland plateau and the s. part of the State, is covered by Carboniferous beds. In its n. part is an area of Silurian, flanked by Devonian rocks, extending into it from Ohio and Indiana. A small part of the State, w. of the Tennessee, is Eocene, with a narrow strip of Quarternary beds along the Mississippi. Except its cultivated land, K. is covered with forests. The mineral resources consist mainly of coal and iron. Manufactures have not as yet become an important industry, being confined to a few leading cities. Its products are mainly corn and tobacco. In 1893 the value of farm products was $67,215,977. In 1890 its manufactures employed a capital of $79,811,980. Its railroads in 1893 had a total mileage of 3,629. Prior to 1770 K. was a common hunting-ground for the Indian tribes. The first whites visited it 1750. Daniel Boone built a fort at Boonesborough 1775. Va. claimed the territory, and in 1776 K. was organized as a county of Va. After the Revolution the people sought to establish a separate government; independence was granted by Va. 1786. Spain sought to induce K. to secede from the U. S., offering special inducements in the way of commerce. This state of things created excitement for a time, till K. was admitted to the Union 1792 as the 15th State. During the Civil War K. as a border State had sympathy with both sections, and endeavored to maintain a neutral position. Ab. 80,000 Kentuckians were in the Northern army, and ab. 40,000 in the Southern. In 1895 the production of coal was 3,207,770 tons and of pig iron 47,501 tons in 1893. Pop., 1890, 1,858,635; 272,981 being colored. Density of pop. 46 per sq. m. (See Map, p. 430.)

**Kentucky River.** In Ky.; branch of the Ohio. Length ab. 250 m., drainage area 6,380 sq. m.; navigable for 95 m. above its mouth.

**Kentucky University.** At Lexington, Ky.; chartered 1865; successor and heir of Bacon Coll., founded by Disciples at Georgetown 1836, and of Transylvania University, chartered 1799. It comprises colleges of Liberal Arts, of the Bible, and of Law, with 231 students in the first, and 141 in the second. It has a staff of 14 professors, an endowment of $200,000, and 12,000 vols. in its libraries.

**Kenyérmező,** BATTLE OF. In 1479; Turks defeated by Matthias Corvinus, which stopped their invasions for 46 years.

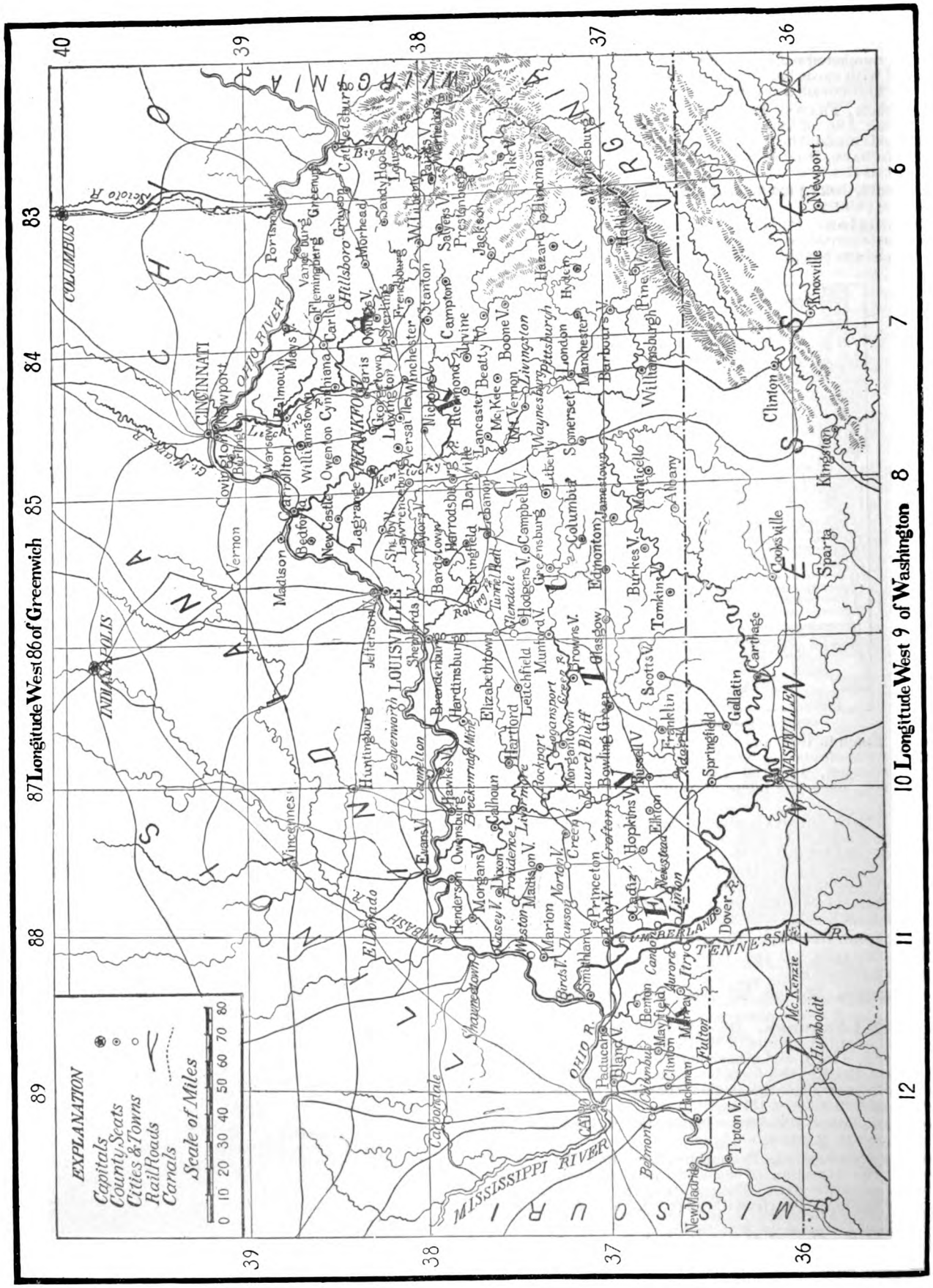
**Kenyon College.** At Gambier, Ohio; controlled by P. E. Ch. The theological seminary was opened at Worthington 1825, and moved to Gambier 1828, where a college was added, and later an academy. In 1895 there were 23 instructors in all departments (12 in the college), and 184 students, of whom 21 were theological and 82 collegiate. The libraries contain 30,000 vols.

**Keokuk.** City of Lee co., Iowa, on the Mississippi, at the mouth of Des Moines R., in the extreme s. e. part of the State. Pop., 1890, 14,101.

**Keokuk.** Subdivision of the Lower Carboniferous Limestone of the Midland States. See CARBONIFEROUS.

**Kepler,** JOHANN, 1571–1630. One of the chief founders of modern astronomy; prof. Gratz 1594–1601; Imperial astronomer 1601–13, but unpaid; at Linz 1613–29. Besides discovering his three famous laws, he did great service as a mathematician.

Johann Kepler.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Danville
Lancaster
Beattyville
Mt. Vernon
Livingston
Pittsburgh
London
Manchester
Barbourville
Williamsburg
Hazard
Hyden
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Paintsville
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Morehead
Sandy Hook
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Lawrenceburg
Shelbyville
Taylorsville
Bardstown
Springfield
Harrodsburg
Danville
Lebanon
Campbellsville
Greensburg
Columbia
Liberty
Somerset
Jamestown
Burkesville
Monticello
Albany
Williamsburg
Pineville
Tompkinsville
Scottsville
Franklin
Gallatin
Carthage
Springfield
Clinton
Cookeville
Sparta
Kingston
Knoxville
Newport
Jeffersonville
Sellersburg
Shepherdsville
Bardstown
Hardinsburg
Elizabethtown
Hartford
Leitchfield
Hodgenville
Munfordville
Glasgow
Edmonton
Burkesville
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Williamsburg
Pineville

He was prominent in bringing logarithms into general use. He set forth the principle of continuity, which is the basis of the Differential Calculus. His works were repub. in 8 vols. 1858–71.

**Kepler's Laws.** 1. The orbit of each planet is an ellipse, with the sun in one of its foci. 2. The radius vector of a planet describes equal areas in equal times. 3. The squares of the periodic times of the planets are proportional to the cubes of their mean distances from the sun.

**Kepler's Problem.** Geometrically, to divide the area of a semicircle in a given ratio by a line drawn from any point in the diameter. It is not capable of direct solution, but many methods of approximation are known.

**Keppel,** AUGUSTUS, R.N., 1725–1786. Victor at Goree 1758, Belleisle 1761, and Havana 1762; tried and acquitted for failure, caused by a subordinate, to capture the French fleet off Ushant 1778; Viscount 1782.

**Keppel,** SIR HENRY, R.N., b. 1809. Admiral 1869. *Borneo*, 1847.

**Keppler,** JOSEPH, 1839–1894. Austrian-American caricaturist; founder of *Puck*.

**Ker,** JOHN, D.D., 1819–1886. Pastor in Glasgow 1851; prof. U. P. Theol. Hall 1876–86. *Psalms*, 1886; *Letters*, 1890.

**Keratitis.** Inflammation of the substance of the cornea, which becomes more or less opaque, with a resulting interference with vision.

**Keratode,** or SPONGIN. Horny substance constituting the fibers of the skeleton of a common bath sponge.

**Kerato-Iritis.** Simultaneous keratitis and iritis.

**Keratosa,** or CERATOSA. Horny sponges, principally the CERAOSPONGIÆ (q.v.).

**Keratry,** ÉMILE DE, COUNT, b. 1832. French dramatist and historical writer, prominent in public affairs 1869–72; son of AUGUSTE HILARION, 1769–1859, novelist, art critic, and official.

**Kerf.** Narrow slit in timber, made by a saw.

**Kerguelen.** See TREMAREC.

**Kerite.** Artificial vulcanite in which the caoutchouc is replaced by tar.

**Kerman.** Persian city noted for shawl and carpet manufactures; trade center between the Persian Gulf and Central Asia. Pop. ab. 40,000.

**Kermes.** Dried body of *Coccus ilicis* formerly used for dyeing scarlet, but largely replaced by cochineal, which is more durable and brilliant. Still used in the East.

**Kermesite.** $Sb_2S_2O$. Antimony oxysulphide, when found as a mineral; usually associated, as a product of alteration, with stibnite.

**Kermes Mineral.** Mixture of antimony trisulphide and trioxide, employed in medicine.

**Kermess,** or KIRMESS. Flemish festivals, once religious, retained as secular holidays.

**Kern,** or KERNE. Light-armed Irish foot-soldier. See GALLOWGLASSES.

**Kerner,** JOHANN SIMON VON, 1755–1830. Court counselor in Würtemburg; botanist. *Abbildung aller ökonomischen Pflanzen*, 1786–96; *Le raisin*, 1803–15; *Genera plantarum*, 1811–28.

**Kerner,** JUSTINUS ANDREAS, 1786–1862. German lyric poet.

**Kerosene.** Products obtained by the distillation of crude petroleum and used as illuminating oil. They are mixtures of hydrocarbons, and consist mainly of nonane and decane.

**Kerouallé,** LOUISE DE. See PORTSMOUTH.

**Kerr,** WASHINGTON CARUTHERS, 1827–1885. State Geologist of N. C. 1866–82; on U. S. Geological Survey 1882–83. *Report*, 1875–81.

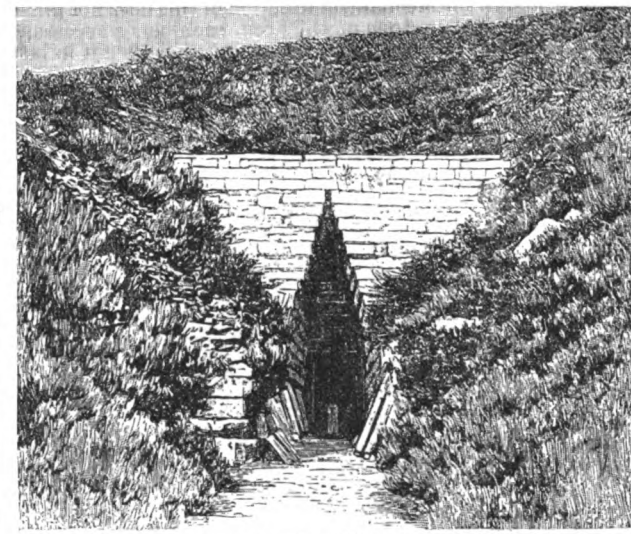
**Kerria.** Yellow-flowered shrub of the Rose family, native of Japan, much planted for ornament.

**Kerr's Law** (ELECTRO-OPTICS). In 1875 Kerr observed that a dielectric under the influence of electrostatic stress becomes doubly refracting, and hence converts plane into elliptically-polarized light. The law of the action is thus stated: "The intensity of electro-optic action of a given dielectric, *i.e.*, the quantity of optical effect (or the difference of retardation of the ordinary and extraordinary rays) per unit of thickness of the dielectric, varies directly as the square of the electric force." The optical effect may be measured by a compensator, and the potential difference by the Thomson electrometer.

**Kerry.** See CATTLE.

**Kershaw,** JOSEPH BREVARD, b. 1822. Brig.-gen. C.S.A. 1862, Major-gen. 1864; engaged chiefly in Va. and Tenn.; Circuit Judge S. C. 1877.

**Kertch.** Seaport in the Crimea; the ancient Panticapæum, colonized ab. 550 B.C. from Miletus; capital of Bosporos: taken



Tomb of the Scythian Kings near Kertch.

by Turks 1475, by Russians 1771; destroyed by the French and English 1855. Pop. ab. 29,000.

**Kerviler,** RENÉ POCARD, b. 1842. French engineer, writer on archæology.

**Kervyn de Lettenhove,** JOSEPH MARIE BRUNO CONSTANTIN, 1817–1891. Belgian historian. *Hist. Flanders*, 6 vols., 1847–50; *Huguenots and "Beggars,"* 6 vols., 1883–86.

**Kesselsdorf.** Village near Dresden; scene of a defeat of Saxons by Prussians, Dec. 15, 1745. The peace of Dresden followed.

**Kessler,** JOHANNES, 1502–1574. Swiss reformer and local historian; pastor at St. Gall 1542.

**Ketchup,** or CATSUP. Sauce used in flavoring meats and soups. It is made from all varieties of fruits and vegetables, but usually from ripe tomatoes, unripe walnuts, or mushrooms.

**Ketone.** Compound in which two radicals or groups are united by a CO group. Examples, dimethyl ketone, $CH_3.CO.CH_3$, ethylmethyl ketone, $CH_3.CO.C_2H_5$.

**Ketteler,** WILHELM EMANUEL VON, 1811–1877. Bp. of Mayence 1850; opponent of Prussia and of the German Empire; polemic writer.

**Kettle Creek.** In Ga.; scene of an American victory over Tories Feb. 14, 1779.

**Keweenaw Point.** Mountainous projection from the upper peninsula of Mich. into Lake Superior. Upon it are extensive copper-mines.

**Keweenaw Series.** Group of the ALGONKIAN (q.v.).

**Kew Gardens.** On the Thames, 6 m. w. of London; formed 1760, nationalized 1840. The Botanic Garden covers 70 acres, the Arboretum 178. The collections are the largest in existence. Visitors are admitted daily, and a monthly *Bulletin* is issued.

**Key,** FRANCIS SCOTT, 1789–1843. American poet, author of *The Star-Spangled Banner*, 1814.

**Keyboard.** Series of white and black levers by depressing which the strings of musical instruments of the pianoforte kind are set to vibrating or wind is admitted to the pipes or reeds of organs.

**Keyed Frog.** Railroad frog fastened to the rails by means of keys or wedges.

**Keyes,** ERASMUS DARWIN, U.S.A., 1810–1895. Major-gen. U. S. Vols. 1862; engaged in Va. 1861–63.

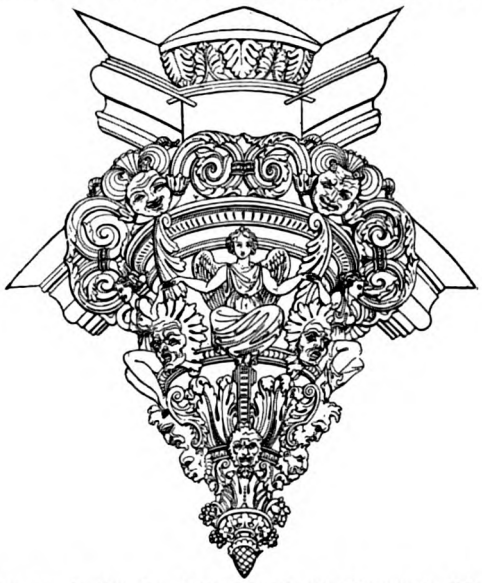
**Key Fruit.** Winged fruits of the maple, ash, and other plants. See SAMARA.

**Keys.** Small cylindrical or rectangular pieces of steel or other strong metal, driven parallel to the axis of a shaft into an opening made partly in the shaft and partly in the hub of the wheel which is to be secured to the shaft by the key. The shaft cannot turn without the hub, unless the key is sheared in two or the hub broken. Where great strength is required, two keys are put in at 90° apart.

**Keys,** POWER OF THE. Committed by Christ to Peter (Matt. xvi. 19), and later to his disciples (John xx. 23); exercised by R. C. Ch. in absolution, penance, and excommunication, and by Protestants in a looser and more general way.

**Keyser,** RUDOLPH, 1803–1864. Norwegian historian.

**Keystone.** Commonly, uppermost and central voussoir of an arch, although the mechanical function of this does not differ from that of any other stone of the arch, each being necessary to lock the arch. The fact that the upper stone is put in last



Keystone in the church Pont de l'Arche, Normandy, 1516.

has probably given rise to the name. In Roman and Renaissance architecture the so-called keystone is often distinguished in treatment, being projected and embellished with a mask or other carved ornament.

**Key West.** Capital of Monroe co., Fla., on an island 60 m. s.w. of Cape Sable, and 110 m. n. by e. of Havana. It has two lighthouses and many cigar factories. Pop., 1891, 18,080.

**Khafra,** or CEPHREN. Egyptian king of the 4th dynasty, builder of the 2d pyramid.

**Khaled,** BEN AL-WALID, 582–642. Moslem leader, who saved Mohammed's army at Muta 629, invaded Persia 632, stormed Damascus 635, defeated the forces of Heraclius on the Hieromax 636, and took Aleppo 638.

**Khalif.** See CALIPH.

**Khallikhan,** IBN, 1211–1282. Cadi of Damascus; biographer of eminent Mohammedans.

**Khamsin.** Hot south wind prevailing occasionally in Egypt during March and April, or in the lenten season, lasting ab. three days. At Alexandria its direction is from s. e. and s. s. e. Its temperature attains 110° at Cairo; the sun is obscured.

**Khan.** 1. Tartar prince or noble. 2. Caravanserai or lodging-place for travelers.

**Kharkoff.** City of s. Russia, in the Valley of the Donetz. It has a large trade, a university, founded 1805, and four yearly fairs. Pop., 1891, 195,100.

**Khartoum,** or KHARTUM. City of e. Soudan, near the

General View of Khartoum.

junction of the Blue and White Nile; founded 1823; occupied by Gordon 1884; taken by the Mahdi Jan. 26, 1885; destroyed 1886. It had considerable trade, and ab. 50,000 inhabitants.

**Khatmandu.** Capital of Nepal, n. India. Pop. ab. 50,000.

**Khayyam,** OMAR. See OMAR KHAYYAM.

**Khazars,** or CHAZARS. Tribe n. of the Caucasus, who became Mohammedans in the 7th century, were prominent in the 10th, and were overthrown by the Slavs in the 11th.

**Khedive.** Viceroy of Egypt since 1867; virtually an independent sovereign, but required to render tribute and military aid to the Sultan. The succession is in the eldest son. Ismail was deposed 1879; Tewfik reigned 1879–92; Abbas acceded 1892.

**Khem.** Egyptian divinity; impersonation of the productive principle in nature.

**Khemnitser,** IVAN IVANOVICH, 1745–1784. Russian fabulist.

**Kheper.** Egyptian creator. His emblem was the beetle or scarabæus.

**Kheraskov,** MIKHAIL MATVEEVICH, 1733–1807. Russian poet. *Rossiada*, 1779.

**Kherson,** or CHERSON. City of s. Russia, on the Dnieper, near its mouth; founded 1778. Pop., 1891, 75,000.

**Khingan Mountains.** Range of n. e. China, separating Mongolia from Manchuria.

**Khita.** Race mentioned on Egyptian monuments: identified with the HITTITES (q.v.).

**Khiva.** Khanate of Turkestan, Central Asia; formerly Chorasmia, or Carasmia. An independent kingdom in the Middle Ages; subdued by Jenghiz Khan 1221, by Tamerlane 1370, and by the Uzbeks 1512, who defeated the Russians 1717 and 1839. It became a Russian dependency 1873. Area ab. 22,300 sq. m.; pop. ab. 650,000.

**Khmelnitsky,** NICOLAI, 1789–1846. Russian dramatist.

**Khokand.** City of Turkestan, on the Syr Daria; acquired by Russia 1875. Pop. ab. 54,000.

**Khomiakoff,** ALEXEI, 1804–1860. Russian poet, dramatist, and polemic theologian.

**Khorsabad.** Assyrian site of the ancient Dur-Sargon,

Court of Sargon's Palace at Khorsabad.

near NINEVEH (q.v.). Here are the ruins of a palace built by Sargon, 722–705 B.C.

**Khunaten.** Name adopted by Amenhotep IV., the last important king of the 18th dynasty of Egypt. The object of his reign was to introduce the monotheistic worship of the sun, but it scarcely survived its founder.

**Khvostchinskaia,** NADEZHOLA ("V. KRESTOVSKY"), 1825–1889. Russian novelist.

**Khyber Pass.** Between the Punjab and Afghanistan; ab. 30 m. long and 60 to 450 ft. wide, though at one point narrowing to 10 ft., with walls 1,400 to 3,375 ft. high. Traversed by Alexander the Great, and thrice by the British 1839–42 and 1878.

**Kibble.** Tub used in hoisting ore from a mine.

**Kickapoos.** Indian tribe in n. Illinois; of Shawnee origin. They migrated s., driving the Illinois tribes before them, ceded their land to the U. S. 1804, and are now less than 1,000 in Indian Territory, with a few in Iowa.

**Kicked Stick.** Running game in which the contestants kick a billet of wood; extremely popular among the native tribes of the s.w. U. S. and n. Mexico. The course often extends for many miles. The game has a ceremonial and religious character, the sticks being marked with masculine and feminine symbols. It is of high antiquity; billets for it are found among the remains of the Cliff Dwellers.

**Kidd,** BENJAMIN, b. 1859. English author. *Social Evolution*, 1894.

**Kidd,** WILLIAM ("ROBERT"), d. 1701. English seaman sent from New York 1696 to repress piracy; arrested on his return, and hanged in London. His piratical exploits, like his buried treasures, were probably much magnified by tradition.

**Kidder,** DANIEL PARISH, D.D., 1815–1891. Prof. Evanston, Ill., 1856, and Drew Theol. Sem. 1871–80. *Mormonism*, 1841; *Brazil* (with J. C. Fletcher), 1857.

**Kidder,** FREDERIC, 1804–1885. New England antiquarian.

**Kidderminster.** Town of Worcestershire, on the Stour; noted for its manufacture of carpets, begun 1735. Pop., 1891, 24,803.

**Kidnapping.** Seizure and transportation of a person from one place to another without his consent; a common-law misdemeanor, now generally defined and regulated by statute.

**Kidney.** Organ, one on each side of the spinal column just below the last ribs, shaped somewhat like a bean, and in man ab. 4 in. in length, 2½ in breadth, and 1½ in thickness, and weighing from 4 to 5 ounces. It consists of a large number of fine tubes surrounded by blood-vessels, which deliver the urine into a common receptacle, the pelvis, whence it passes into the bladder through the ureter.

**Kidron,** or KEDRON. Brook in ravine between Jerusalem and the Mount of Olives.

**Kieff,** or KIEV. "Mother City" of Russia, on the Dnieper, founded 864; seat of the first church, first Christian school, and first library in Russia; independent for near 4 centuries; sacked

Kieff.

by the Mongols 1240; held by Lithuania 1320–1569, then by Poland, and by Russia since 1654. The Univ. of St. Vladimir, moved here from Vilna 1833, has a library of 150,000 vols., and (1895) 2.244 students. Pop., 1891, 183,640.

**Kieft,** WILHELM, 1600–1647. 5th Gov. of New Netherlands, 1638; recalled 1647.

**Kiel.** Seaport of Holstein, Prussia, on an inlet from the Baltic; founded ab. 875; terminus of the Baltic Canal, opened 1895. It has much commerce. Its university, founded 1665, had, in 1895, 532 students. Pop., 1890, 69,172. See NORTH SEA CANAL.

**Kiel,** KORNELIS, ab. 1537–1607. Dutch lexicographer.

**Kielland,** ALEXANDER LANGE, b. 1849. Norwegian novelist and dramatist. *Novelettes*, 1879–80; *Working People*, 1881; *Else*, 1881; *Poison*, 1883; *Fortune*, 1884; *Snow*, 1886; *Jacob*, 1891. His *Garman and Worse*, 1880, *Skipper Worse*, 1882, and *Tales of Two Countries*, have appeared in English versions, 1885–91.

**Kiepert,** HEINRICH, b. 1818. German geographer, prof. at Berlin since 1859.

**Kierkegaard,** SÖREN AABY, 1813–1855. Danish philosophic writer of high rank and extensive influence. *Either—Or*, 1843; *Stages of Life*, 1845; *The Moment*, 1855.

**Kieselguhr.** Silicious INFUSORIAL EARTH (q.v.).

**Kiesewetter,** RAPHAEL GEORG, 1773–1850. Austrian writer on music. *Verdienste der Niederländer um die Tonkunst*, 1829; *Geschichte der europäisch-abendländischen oder unserer heutigen Musik*, 1834; *Ueber die Musik der neuern Griechen*, 1838; *Guido von Arezzo*, 1840; *Schicksale und Beschaffenheit des Weltlichen Gesanges*, 1841; *Musik der Araber*, 1842.

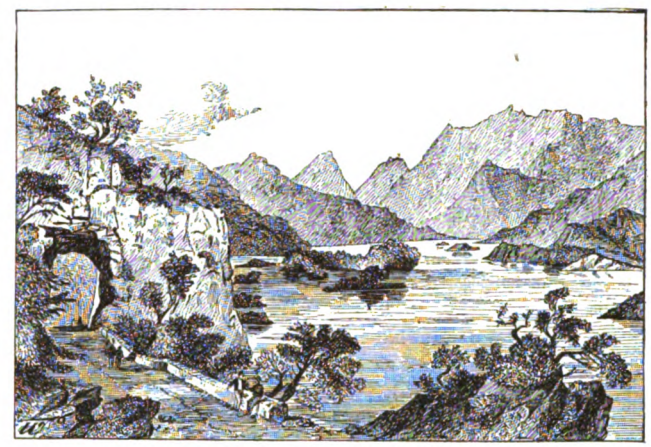
**Kilauea.** Active volcano in Hawaii; latest eruption July 11, 1896.

**Kilian,** ST., 644–697. Irish missionary to Germany; Bp. of Würzburg ab. 690.

**Kiliani,** MARTIN, 1858–1895. Metallurgist for the General Electric Company of Berlin. His researches on the refining of copper by electricity first gave a true scientific insight into that important process. He was director of the largest aluminium works in Europe, at the Rhine Falls, where he made several improvements in the metallurgy of aluminium.

**Kilima-Njaro.** Mountain of e. Africa. Lat. 3° 20′ S., long. 37° 50′ E.; ht. ab. 19,500 ft.

**Killarney,** LAKES OF. In the mountains of Kerry, ab. 45 m. n. of Cork; famous for their scenery, and celebrated in



Upper Lake, Killarney.

legend. They cover ab. 5,000, 680, and 430 acres. These lakes are fed by the R. Fleck and discharge their waters by the R. Laune.

**Killas.** Graywacke, paleozoic schists, intersected by the elvans and tin and copper lodes of Cornwall.

**Killiecrankie.** Pass in Perthshire, where the royal troops under Mackay were routed July 27, 1689, by Dundee.

**Killen,** WILLIAM DOOL, D.D., b. 1806. Presbyterian writer and educator. Prof. Belfast Coll. 1841; pres. 1869. *Presbyterian Church in Ireland*, 1867; *Hist. of Ireland*, 1875; *Church Government*, 1890.

**Killigrew,** THOMAS, 1611–1684, and SIR WILLIAM, 1605–1693. English playwrights.

**Kilns.** See FURNACES.

**Kilogram.** Metric standard of mass; intended to be the quantity of matter in one cubic decimeter of water at a temperature of 3.9° C. The standard was constructed of platinum by Borda, and is preserved in the Archives in Paris; copies of it were deposited in different places, so that if the original be destroyed or injured it may be easily restored. More recent comparisons have shown that 1 cubic decimeter of water at 3.9° C. contains 1.000013 kilograms. According to Prof. W. H. Miller, the standard kilogram weighs 15432.34874 grains. The unit of mass employed in science is the one-thousandth part of a kilogram, or the GRAM (q.v.), and is therefore the mass of 1 cubic centimeter of water at 3.9° C.

**Kilogrammeter.** Gravitation metric unit of work, equal to the work required to raise 1 kilogram 1 meter vertically against the force of gravity; equivalent to 980 by $10^5$ ergs.

**Kilpatrick,** HUGH JUDSON, 1836–1881. Brig.-gen. U. S. Vols. 1863, Major-gen. 1865; noted for a raid near Richmond Feb. 25–March 4, 1864, and other cavalry exploits; prominent as a political speaker after the war; Minister to Chili 1865–68 and 1881.

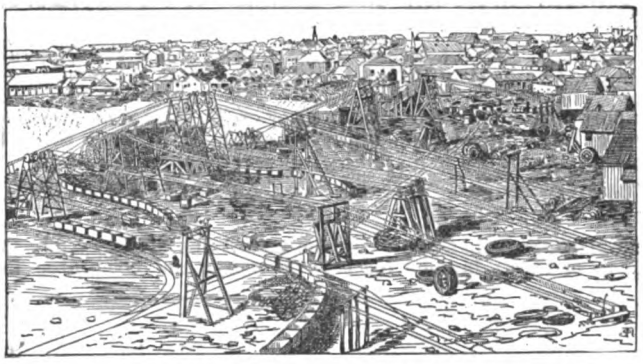
**Kilsyth.** Town of Stirlingshire, 13 m. n. e. of Glasgow. Here Montrose defeated 7,000 Covenanters Aug. 15, 1645. Pop., 1891, 6,064.

**Kilt.** Garment worn by HIGHLANDERS (q.v.), extending from the girdle to the knee. See CLAN.

**Kimball,** HEBER CHASE, 1801–1868. Mormon apostle 1835; one of the founders of Salt Lake City 1847.

**Kimball,** RICHARD BURLEIGH, LL.D., 1816–1892. American novelist. *St. Leger*, 1850.

**Kimberley.** Capital of W. Griqualand, S. Africa; 647 m. by rail n. e. of Capetown. Diamonds were first discovered here



Kimberley and its Diamond Mines.

1867, but not till 1870 was the importance of the discovery realized and the rush to the fields began. Pop. 1891, 28,700.

**Kimberley,** JOHN WODEHOUSE, EARL OF, b. 1826. Member of several cabinets; Lord-lieutenant of Ireland 1864-66; Baron 1846, Earl 1866.

**Kimchi,** DAVID, ab. 1160–1240. Rabbi of Provence, author of an important Hebrew grammar and lexicon, and of O. T. commentaries.—His father, JOSEPH, and brother, MOSES, wrote similar works.

**Kin,** NEXT OF. Blood relatives to whom the personal property of an intestate goes under the statute of distributions.

**Kincaid,** EUGENIO, 1798–1883. American missionary in Burmah 1830–42 and 1854–65.

**Kinchinjinga.** Peak of the Himalayas. Ht. 28,176 ft.

**Kinæsthetic Feelings.** The impressions resulting from movements of the body. The resident sensational effects of bodily movements which become the basis of our knowledge of the position of our bodies in space. These impressions originate in the skin, joints, tendons, or in any structure supplied with sensory nerves which is concerned in the movement.

**Kindergarten.** Play-school where children from 3 to 7 years of age are instructed by the use of objects, instructive songs, and games, propounded 1826 by FROEBEL, FRIEDRICH (q.v.).

**Kinderhook.** Subdivision of the Lower Carboniferous Limestone of the Midland States. See CARBONIFEROUS.

**Kinematics.** Science of motion, separated from the study of the forces which produce that motion; so named by Ampère; called also the science of Pure Mechanism, or the Geometry of Machinery, by different writers. The best authorities are Willis, Rankine, Kennedy, and, in Germany, Reuleaux.

**Kinetics.** Branch of dynamics which treats of the motions produced by forces not in equilibrium.

**King,** CHARLES, b. 1844. Son of Gen. Rufus; Captain U.S.A., disabled by wounds in Indian fighting, and retired 1879; military novelist. *The Colonel's Daughter*, 1883; *Marion's Faith*, 1885; *A War-Time Wooing*, 1888; *Sergeant Crœsus*, 1895.

**King,** CLARENCE, b. 1842. Director U. S. Geological Survey 1878–81. *Mountaineering in the Sierra*, 1871; *Systematic Geology*, 1878.

**King,** EDWARD, VISCOUNT KINGSBOROUGH, 1795–1837. M.P. from Cork 1818–27. *Antiquities of Mexico*, 10 vols., 1830–48.

**King,** GRACE. American writer, chiefly of tales on Creole life. *M. Motte*, 1888; *New Orleans*, 1896.

**King,** JONAS, D.D., 1792–1869. American missionary in Syria 1823–26, and in Greece from 1826.

**King,** RUFUS, LL.D., 1755–1827. Delegate to Congress from Mass. 1784–87; U. S. Senator from N.Y. 1789–96 and 1813–25; Minister to England 1796–1804 and 1825–26; author, with Hamilton, of the Camillus letters, 1795.—Of his sons, JOHN ALSOP, 1788–1867, was M.C. 1849–51 and Gov. of N.Y. 1857–59; CHARLES, LL.D., 1789–1867, was Pres. of Columbia Coll. 1849–63.—The latter's son, RUFUS, 1814–1876, was Brig.-gen. U. S. Vols. 1861–63, and Minister to Rome 1863–67.

**King,** THOMAS STARR, 1824–1863. Unitarian pastor in Boston 1848–60, and San Francisco 1860–63; noted for eloquence and patriotism. *The White Hills*, 1859.

**King,** WILLIAM RUFUS, 1786–1853. M.C. from N. C. 1811–16; U. S. Senator from Ala. 1819–44 and from 1848; Minister to France 1844–46; pres. Senate 1850–53; Vice-Pres. 1853.

**Kingbird** (BEE MARTIN). American fly-catching, passerine bird of the genus *Tyrannus*. The typical species is ab. 8 in. long, in color blackish ash, with head and tail darker, and white at tip of tail and under parts. They feed on insects while flying, and courageously defend their nests, attacking even hawks and eagles.

**King Crow,** or DRONGO. Small, fly-catching bird of India, colored like a crow, but with shrike-like bill. While the female sits on the nest, the male drives off crows, hawks, and other large birds that approach near.

**Kingfishers.** Bright-colored, fish-catching birds, related to the hornbills and toucans. They feed also on reptiles, shell-fish, and insects. Only one genus (*Ceryle*) is found in the w. hemisphere. The Old World has 150 species and 19 genera. The Malay Archipelago is the center for the Alcedinoid division; the Halcyonoid division is best developed in the Ethiopian region. See ALCEDINIDÆ.

Kingfisher (*Ceryle rudis*).

**King George's War.** Between the English and French colonies in America 1744–48; a consequence of the War of the Austrian Succession 1741–48. The capture of Louisburg, June 28, 1745, was the most important event.

**Kinglake,** ALEXANDER WILLIAM, 1811–1891. English historian. *War in the Crimea*, 8 vols., 1863–87.

**Kinglet** (WREN). Small, passerine bird of the genus *Regulus*, and family *Sylviidæ*; length 4 in. The most common species of America are the Golden-crowned and the Ruby-throated. In n. temperate latitudes they remain during the winter.

**King-Maker.** See WARWICK.

**Kingo,** THOMAS, 1634–1703. Danish hymnist; Bp. of Funen 1677.

**King Philip's War.** Between the New England colonists and the Indians under the Sachem Philip, 1675–76. It cost the lives of 600 whites and thousands of Indians.

**King Post Truss.** Bridge truss having a single post at the middle, whose top is connected with the abutments by two inclined struts; used only for very short spans of country highway bridges.

**Kings,** BOOKS OF. 11th and 12th of O. T.; really one work, compiled, possibly by Jeremiah, from older sources; giving the history of Israel under the Monarchy, ab. 1000–600 B.C.

**Kingsborough,** LORD. See KING, EDWARD.

**King's College.** In London; chartered 1828, opened 1831. It has several courses and departments, with a branch for women, who were admitted to degrees 1880.

**King's Daughters.** "Sisterhood of service," organized 1886 by Mrs. M. Bottome; headquarters in N.Y. City.

**King's Evil.** Scrofula, once believed to be curable by the royal touch. Edward the Confessor began the practice 1051; Charles II. is said to have touched 92,107 persons; George I. discontinued the custom. Louis XVI. is said to have cured 2,400 people in this way in 1775. Dr. Johnson was touched by Queen Anne.

**Kingsley,** CHARLES, 1819–1875. English novelist and poet, rector of Eversley from 1844, prof. at Cambridge 1860–69, Canon of Chester 1869, and of Westminster 1873. He advocated Christian Socialism, and did much to popularize and apply the views of his friend F. D. Maurice. His novels, *Alton Locke*, 1849; *Yeast*, 1851; *Hypatia*, 1853; *Westward Ho!* (*Sir Amyas Leigh*), 1855; *Two Years Ago*, 1857; and *Hereward*, 1866, were widely read, as were his sermons and juvenile books. *The Heroes*, 1856; *The Hermits*, 1869; *At Last*, 1872; *Prose Idyls*, 1873.—His brother, HENRY, 1830–1876, resident in Australia 1853–58, was another able novelist. *Geoffrey Hamlyn*, 1859; *Ravenshoe*, 1861; *Austin Elliott*, 1863; *Hillyars and Burtons*, 1865.

**King's Mountain,** BATTLE OF. Oct. 7, 1780, on the mountain range between N. C. and S. C. The Americans were victorious.

**Kingston.** City of Ulster co., N.Y., on the w. bank of the Hudson, 90 m. n. of New York City; settled 1665; burned by the British 1777; chartered as a city 1872. Pop., 1890, 21,261.

**Kingston.** Capital of Jamaica since 1872; on Port Royal Bay; founded 1693. Kingston harbor is inclosed on the s. by a

View of Kingston, Jamaica.

strip of land at the extremity of which is Port Royal. It is the principal naval station of Great Britain in the W. Indies. Pop., 1891, 46,542.

**Kingston.** Capital of Frontenac co., Ontario, and in 1841–44 of Upper Canada; on Lake Ontario; site of Queen's Univ. and several colleges. Pop., 1891, 19,264.

**Kingston,** WILLIAM HENRY GILES, 1814–1880. English author of some 125 tales for boys.

**Kingston-on-Hull.** See HULL.

**Kingston Valves.** Those in marine engines of the surface condensing type through which the circulating water enters the hull of the vessel to cool the tubes and leaves the hull on its way overboard.

**King's Yellow.** See ORPIMENT and ARSENIOUS SULPHIDE.

**King-te-Chin.** City of China, in the province Chiangsi, near Lake Po-yang; long important for its manufactures of porcelain and pottery. Pop. between 500,000 and 1,000,000.

**King William Land.** Large island of N. America, in the Arctic Ocean.

**Kinjiro,** NINOMIYA, 1787–1856. Japanese social reformer, founder of the Hotukusha or Compensation-Gifts Association. It has 5,520 branches and nearly 19,000 members.

**Kinkajou.** S. American coon-bear. It resembles a cat, is in color yellow, with tail long and prehensile, feet quadrumanous. It shuns the light, lives in trees, and feeds on honey and insects. See PROCYONIDÆ.

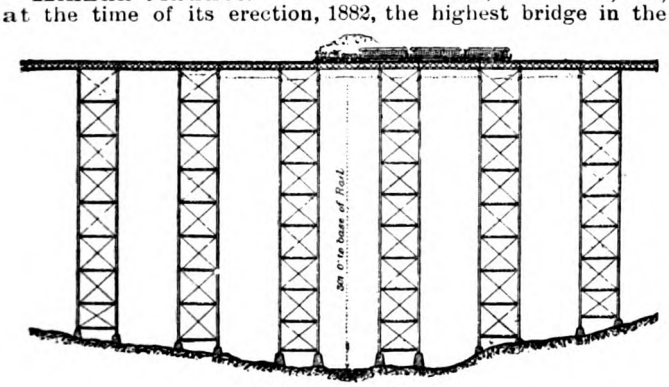
**Kinkel,** JOHANN GOTTFRIED, 1815–1882. German poet and art historian, prof. in England 1853 and at Zurich 1866. *Otto*, 1846; *Nimrod*, 1857.

**Kinnikinnik.** *Cornus sericea.* Shrub of the Dogwood family, native of e. N. America; called Silky Cornel.

**Kino.** Red, astringent, jelly-like juice obtained by incisions made in the trunks of several trees of the natural order *fabaceæ*, found in the E. Indies and Australia, used in medicine.

**Kinston.** Capital of Lenoir co., N. C., 35 m. w. of Newbern; scene of engagements Dec. 14, 1862, and March 8 and 10, 1865, in which the Confederates were driven back. Pop., 1890, 1,726.

**Kinzua Viaduct.** On the Erie railroad, near Alton, Pa.; at the time of its erection, 1882, the highest bridge in the



Kinzua Viaduct.

world. It is 2,053 ft. long and has 20 towers; the greatest height of the rail above the creek is 301 ft.

**Kiong Choo.** Seaport of China, on the island of Hainau. Pop. ab. 40,000.

**Kioto.** City of Japan, near the s. end of the island of Niphon. Long the capital, it remains the chief center of literature, science and art. Pop., 1890, 290,000.

**Kip,** WILLIAM INGRAHAM, D.D., LL.D., 1811–1893. Bp. of California 1853. *Double Witness of the Ch.*, 1844; *Catacombs of Rome*, 1854.

**Kipling,** RUDYARD, b. 1865. Anglo-Indian novelist and poet, now resident in the U. S. *The Light that Failed*, 1890; *The Naulakha* (with W. Balestier), 1892. In his own peculiar field, short stories of life in India, as *Plain Tales from the Hills*, 1888, and *Soldiers Three*, 1889, he has won unparalleled success. For delineations of animal life, *The Jungle Book*, 1894, stands alone in literature.—His father, JOHN LOCKWOOD, pub. *Beast and Man in India*, 1893.

**Kippis,** ANDREW, D.D., F.R.S., 1725–1795. Pastor at Westminster from 1753; editor of Lardner's works, 1788, and of *Biographia Britannica*, Vols. I.–V., 1778–93.

**Kirby,** WILLIAM, F.R.S., 1759–1850. Rector of Barham, Suffolk, from 1796; entomologist. *Habits and Instincts of Animals*, 1835.

**Kirchbach,** HUGO EWALD, GRAF VON, 1809–1887. Prussian general, prominent in the wars with Austria and France, 1866–70.

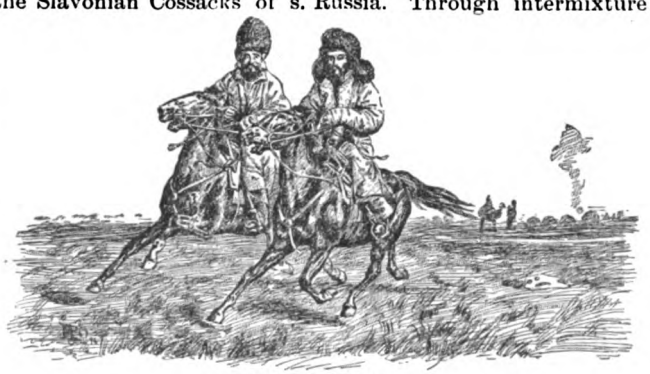
**Kirchhoff,** GUSTAV ROBERT, 1824–1887. Prof. of Natural Philosophy at Heidelberg 1854. His most important work was with Bunsen in the development and use of the spectroscope. *Chemische Analyse durch Spectral beobachtung*, with Bunsen, 1861; *Das Sonnenspectrum und die Spectra der chemischen Elementa*, 1861; *Vorlesungen über analylische Mechanik*, 1874.

**Kirchhoff,** JOHANN WILHELM ADOLF, b. 1826. Prof. of Classical Philology at Berlin; ed. of the *Corpus Incriptionun Græcarum.*

**Kirchhoff's Laws.** 1. In any closed circuit the sum of the products of the current strengths and resistances is equal to the sum of the electromotive forces in that circuit. 2. In any electric circuit the algebraic sum of the strengths of the currents which meet at a point is equal to zero.

**Kireevsky,** IVAN, 1806–1856. Russian critical and philosophic writer. His *European Culture*, 1852, and *New Principles*, 1856, are wildly panslavic. *Works*, 1861.

**Kirghiz.** Turks of s. w. Siberia, numbering ab. 3,000,000. They call themselves Kasaks (Cossacks), meaning riders. The latter term is properly restricted to the tribes of the steppes of the w. part of that region; they should not be confounded with the Slavonian Cossacks of s. Russia. Through intermixture



Kirghiz Horsemen.

with w. Asiatic blood, they have lost much of their Mongolioid characteristics, acquiring white complexions and European features. The tribes of the e. uplands, the Kara-Kirghiz, have purer Mongolioid blood, though their language and religion are Turkish. Both groups are nomad shepherds, and at times robbers.

**Kirk.** Scottish form of Church; system of Presbyterianism legally established in Scotland.

**Kirk,** JOHN FOSTER, LL.D., b. 1824 in New Brunswick. Ed. *Lippincott's Mag.* 1870–85. *Hist. Charles the Bold*, 1863–68; supplement to Allibone's *Dictionary of Authors*, 2 vols., 1891.—His wife, ELLEN WARNER (OLNEY), b. 1842, has pub. *Margaret Kent*, 1886; *Sons and Daughters*, 1887; *Queen Money*, 1888; *A Daughter of Eve*, 1889; *Walford*, 1891, and other novels.

**Kirkbride,** THOMAS STORY, M.D., LL.D., 1809–1883. Head from 1840 of Pa. Hospital for the Insane, whose treatment, by his labors and writings, he did much to improve.

**Kirke,** SIR DAVID, 1596–1656. Gov. of Newfoundland; knighted 1633 for naval exploits in Canada.

**Kirkes,** WILLIAM SENHOUSE, ab. 1820–1864. English writer on physiology.

**Kirke's Lambs.** Troopers commanded by Col. Percy Kirke, whose atrocities at Sedgemoor 1685 may in part be accounted for by their previous service in Africa.

**Kirkland,** JOSEPH, 1830–1894. American novelist. *Zury*, 1887; *The MacVeys*, 1888.—His mother, CAROLINE MATILDA (STANSBURY), 1801–1864, was a prolific writer.

**Kirkman,** MARSHALL MONROE, b. 1842. American writer on railways.

**Kirkwall.** Capital of the Orkneys, n. e. of Scotland; noted for its remains of mediæval buildings. Part of the Cathedral, begun 1137, is still used. Pop., 1891, 3,895.

**Kirkwood,** DANIEL, LL.D., 1814–1895. Prof. of Mathematics at Indiana Univ. 1856–86. *Meteoric Astronomy*, 1867; *Comets and Meteors*, 1873; *Asteroids*, 1887.—His cousin, SAMUEL JORDAN, 1813–1894, was Gov. of Iowa 1859–63, and 1875–77, U. S. Senator 1866 and 1877–81, and Sec. of the Interior 1881–82.

**Kirsch.** Spirit distilled from the fermented juice of a wild cherry, with its seeds, made in Germany and France. It contains ab. 50 per cent of alcohol, and its flavor is due to the presence of a little prussic acid, derived from the seeds.

**Kirving.** In mining, undercutting, holing, or judding.

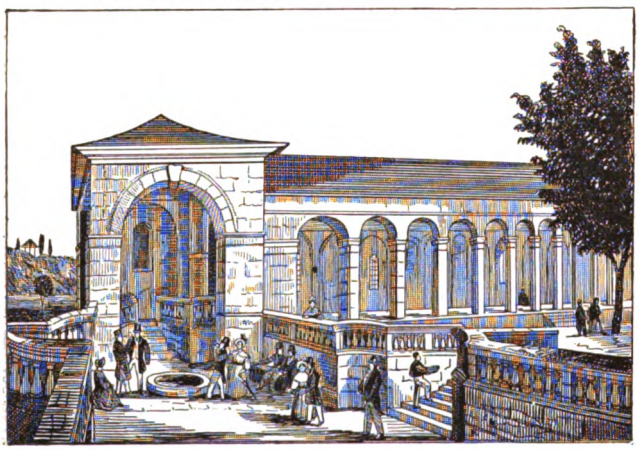
**Kirwan,** RICHARD, 1733–1812. Irish mineralogist and chemist. His *Elements of Mineralogy*, 1784, was a pioneer work.

**Kisfaludy,** SANDOR, 1772–1844. Hungarian poet and dramatist.—His brother, KAROLY, 1788–1830, wrote comedies and historical plays.

**Kishineff.** Capital of Bessarabia, s.w. Russia; on a branch of the Dniester; acquired 1812. Pop. ab. 130,000.

**Kiss,** AUGUST, 1802–1865. German sculptor. His bronze mounted Amazon attacked by a panther, in front of the Berlin Museum, is one of the finest modern works.

**Kissingen.** Watering-place of Bavaria, on the Saale. Its mineral springs are highly valued. It has three principal



Ragozi Spring at Kissingen.

springs of saline-chalybeate water, large quantities of which are exported annually in bottles. Mentioned 823 by the Slavonic name Chizzicha. Pop., 1890, 4,245.

**Kit-Cat Club.** In London ab. 1703–23; composed of prominent Whigs.

**Kitchener,** SIR HERBERT, b. 1851. English officer, in Egypt since 1883; sirdar of the Egyptian army, commanding the expedition to the Soudan 1896.

**Kitchen God.** God of the Furnace, worshiped in Chinese households on the 1st and 15th of each month; represented by an image, picture, or tablet, bearing his name, placed on the wall near the furnace. With the other domestic deities, he is believed to ascend to heaven Dec. 24, to report the conduct of the family for the year.

**Kitchen-Middens.** Enormous heaps of refuse, consisting mainly of shells of shell-fish used for food, but also containing prehistoric implements and bones of wild animals. They antedate the use of metals, and represent a very ancient prehistoric culture. They are not confined to Scandinavia, though most studied and best known there.

**Kites.** Falconoid birds having long wings, the tail usually forked, bill imperfectly notched, tarsus shorter than the tibia. They are mainly of the Old World, and eat insects and snails.

**Kites.** Probably introduced into Europe within comparatively recent years from Asia. Their English name, that of the bird of prey, agrees with the Chinese-Corean, the kite bird. The Chinese attribute their invention to one of their generals in the 2d century B.C., who is said to have used them to measure the distance of a citadel he was besieging. Throughout e. Asia, a magical and religious significance is attached to kites.

Kite-Flying at Hae-kwan, China, on the Ninth Day of Ninth Moon.

They are usually flown at certain festivals, and appear to have been originally employed as a symbol of the over-soul. Fighting kites, by crossing and cutting the strings, is a popular amusement in Corea and parts of Japan, as well as in India and the Malayan peninsula. Kites have now become quite a study for older persons interested in observing atmospheric phenomena.

**Kite Wind.** South and s. w. wind; so called in Siam because favorable for flying kites.

**Kithara,** or CITHARA. Most admired instrument of the lyre kind among the ancient Greeks. It gave its name to the modern guitar, chittarra, chitarone, and zither.

**Kittatinny** (or BLUE) **Mts.** Portion of the Appalachian mountain system in Penn. and New Jersey.

**Kitto,** JOHN, D.D., 1804–1854. English layman, who wrote much on Palestine, Persia, and the Scriptures. *Cyclopædia of Biblical Literature*, 1843–45.

**Kiu-Kiang.** City of China, on Yangtse-kiang, ab. 440 m. from its mouth; opened to foreigners 1861. Pop., 1890, 53,000.

**Kiuprili,** or KÖPRILI. Town in Macedonia, source of a family of viziers, founded by Kiuprili Muhammed 1586–1661, who became grand vizier 1656.

**Kiu-Siu.** Southernmost island of Japan. Area 13,772 sq. m.

**Kiwi.** See APTERYGIA.

**Kizil-Irmak.** Chief river of Asia Minor, the ancient Halys. Rising in two branches near the Taurus and Anti-tauras Mts., it flows mainly n. and n. e. to the Black Sea. Length ab. 500 m.

**Kjerulf,** HALFDAN, 1815–1868. Norwegian composer.

**Klaczko,** JULIAN, b. 1828. Polish Jew, living in Paris; writer on politics and history.

**Klamath.** River, which rises in a series of lakes in s. Oregon, e. of the Cascade Range, cuts through them and the coast ranges, and flows into the Pacific in n. Cal. Length ab. 250 m., drainage area 14,660 sq. m.

**Klapka,** GYÖRGY, 1820–1892. Hungarian general, famous for his defense of Komorn after the war elsewhere had ended; exiled 1849–67; military historian. *War in Hungary*, 1850–51.

**Klaproth,** MARTIN HEINRICH, 1743–1817. German chemist and mineralogist, prof. Berlin 1789. *Beiträge zur chemischen Kenntniss der Mineralkörper*, 6 vols., 1795–1815.—His son, HEINRICH JULIUS VON, 1783–1835, resident in Paris from 1815, wrote much on Asia, where he had traveled in youth. His *Asia Polyglotta*, 1823, dealt with Oriental languages.

**Klausenberg,** or KOLOZSVAR. Capital of Transylvania; taken by Hungarians 1848. Its university was founded 1872. Pop., 1890, 34,859.

**Kléber,** JEAN BAPTISTE, 1755–1800. French general, commanding in Egypt and Syria 1799; victor at Heliopolis; murdered at Cairo.

**Klebs,** EDWIN, b. 1834. Prof. Berne 1866, Würzburg 1871, Prague 1873, and Zurich 1881; writer on pathology.

**Klein,** BRUNO OSCAR, b. 1856. German-American composer and organist. His opera, *Kenilworth*, was produced 1895 in Hamburg.

**Klein,** JULIUS LEOPOLD, 1810–1876. German dramatist. *History of the Drama*, 13 vols., 1865–76.

**Kleist,** EWALD CHRISTIAN VON, 1715–1759. German poet. *Der Frühling*, 1749.

**Kleist,** HEINRICH VON, 1777–1811. German poet, dramatist, and novelist. *Michael Kohlhaas.*

**Klenze,** LEO VON, 1784–1864. German architect and writer, designer of many fine buildings at Munich and elsewhere.

**Kleptomania.** Desire to steal, often displayed by persons whose circumstances and character, placing them above external temptation of that kind, indicate it to be a form of insanity.

**Klicpera,** VACLAV KLIMENT, 1792–1859. Hungarian dramatist and novelist.

**Klinger,** FRIEDRICH MAXIMILIAN VON, 1753–1831. German dramatist and novelist. *Sturm und Drang*, 1776.

**Klinkerfuss,** WILHELM, 1827–1884. Director of Göttingen Observatory; discoverer of many comets, and author of a treatise on Theoretical Astronomy.

**Kliushnikov,** IVAN, b. 1810. Russian poet.

**Klopp,** ONNO, b. 1822. German writer on history.

**Klopstock,** FRIEDRICH GOTTLIEB, 1724–1803. German epic and lyric poet. His *Messiah*, 1748–73, was highly esteemed. *Odes*, tr. 1847.

**Knapp,** ALBERT, 1798–1864. German hymnist. His *Liederschatz*, 1837, is an important compilation.

**Knapweed.** *Centaurea nigra.* Purple-flowered weed of the Composite family, native of Europe, introduced into N. America.

**Knatchbull-Hugessen.** See BRABOURNE, LORD.

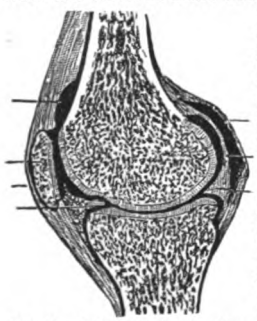
**Knäuel.** Convoluted filament (mitom) in which the chromatin of a cell-nucleus exists during the nutritive or resting stage. See INDIRECT CELL-DIVISION.

**Knaus,** LUDWIG, b. 1829. Leading German genre painter.

**Knawel.** *Scleranthus annuus.* Insignificant herb of the natural family *Azoiaceæ*, native of Europe, introduced as a weed into the U. S.

**Kneas,** STRICKLAND, 1821–1884. Surveyor and engineer of Philadelphia, designer of the Chestnut St. Arch Bridge.

**Knee.** Articulation between the femur or thigh-bone, above, and the tibia or shin-bone, below. A third bone, the patella, or knee-cap, also enters into the structure of this joint anteriorly; the articular surfaces of these bones are covered with cartilage, and connected together by ligaments, some of which invest the joint and lie external to it, while others occupy its interior. The synovial membrane is the largest in the body. It lines the investing ligament, and is prolonged on the front of the femur above the articular surface, covers certain of the ligaments in the interior of joint, and forms folds on a large cushion of fat placed between the tibia and patella. The most important of the external ligaments are the anterior or *Ligamentum Patellæ*, which is in reality that portion of the *Quadriceps Extensor Cruris* which is continued from the knee-cap to the tubercle of the tibia; one internal and two external lateral ligaments; a posterior ligament; and a capsula ligament, which surrounds the joint in the intervals left by the preceding ligaments.



Vertical Sagittal Section through the inner half of the Left Knee.

**Knee.** Bent piece of iron or timber; used in the framework of a ship or in a bridge-truss.

**Knee Jerk.** Also called patellar reflex; the peculiar involuntary movement of the foot produced by smartly tapping the patellar tendon just below the knee. On account of its accessibility, the knee jerk has been largely used as a type of spinal reflex action in experiments on that subject. There is, however, considerable doubt as to its being purely spinal in character. See REFLEX ACTION.

**Knees,** CYPRESS. Vertical, woody growths arising from the horizontal roots of the Bald Cypress (*Taxodium distichum*).

**Kneller,** SIR GODFREY, 1648–1723. German-English artist, court painter to Charles II. 1680, succeeding Sir P. Sely; knighted 1692; Baronet 1715. The best-known English portraits of the time are by these two.

**Knickerbocker,** JOHANNES, 1749–1827. Friend of W. Irving, who perpetuated the name by his *Hist. of New York*, by Diedrich Knickerbocker, 1809.—His forefather, HERMAN JANSEN, was one of the earliest settlers of N.Y. The name is also applied in New York to the descendants of the original Dutch settlers.

**Knies,** KARL, b. 1821. German political economist, of the historical school; writer on educational and economic subjects.

**Knife-Edges.** See BALANCE.

**Knight,** CHARLES, 1791–1873. English author. Editor or publisher of the *Penny Magazine*, 1832–45, and other useful works. *Hist. England*, 8 vols., 1862.

**Knight,** JONATHAN, 1787–1858. First chief engineer of the Baltimore and Ohio Railroad.

**Knight,** RICHARD PAYNE, 1750–1824. English antiquarian. *Worship of Priapus*, 1786; *Taste*, 1805.—His brother, THOMAS ANDREW, F.R.S., 1758–1838, wrote much on horticulture.

**Knighthood.** In feudal times the knight was one bound to certain military services in return for his allotted possessions. During the Crusades the knights assumed that character of religious warrior which has made them stand out in bold relief against the somber background of the Middle Ages. Bound to poverty and chastity, it was theirs in clanging armor to storm the citadels of the infidel, to battle for the Cross and lady-love, conscious that success brought glory, and death, paradise. For information concerning the important orders of religious knighthood see KNIGHTS OF ST. JOHN, KNIGHTS TEMPLARS, and TEUTONIC KNIGHTS.

A Knight of the 17th Century.

**Knighthood Service.** See TENURE.

**Knights Hospitalers.** See HOSPITALERS.

**Knights of Labor.** Federation of trades-unions, organized at Philadelphia 1869. It consists of local assemblies, grouped into district assemblies, and these formed into a General Assembly of the U. S. Annual meetings of delegates have been held, and the number of members increased, until in 1886 it claimed to have more than half a million. Since then its numbers have been reduced by unsuccessful strikes and internal dissensions, but it still has a large membership and strong organization.

**Knights of Malta,** or OF RHODES. See KNIGHTS OF ST. JOHN.

**Knights of Pythias.** Order founded 1864 at Washington for social recreation and mutual life-insurance. It claims above 400,000 members.

**Knights of St. Crispin.** Trade-union, formerly large and influential, in the boot and shoe manufacture; organized 1867 in Milwaukee. It spread rapidly, subordinate lodges being formed in almost every town where that industry existed. In 1869 it numbered 83,000 members, but it died ab. 1873.

**Knights of St. John,** or HOSPITALERS. Order originated in a hospital founded 1023 by pilgrims in Jerusalem. The military organization dates from ab. 1120. They defeated the Turks at Antioch 1119, defended Acre 1290, and were in Cyprus till 1310, when they took Rhodes. Losing it 1522, they went to Crete, then to Sicily. Charles V. gave them Malta 1530, where they stood a four months' siege by the Turkish fleet 1565. The order was suppressed in England 1559, and in France 1792, having been long obsolete. See HOSPITALERS.

**Knights Templars.** Military order originated ab. 1118 by nine knights who vowed to protect pilgrims in the Holy Land; named from their quarters in the palace of Latin kings on Mt. Moriah, known as Solomon's Temple. In 25 years the order was established in nearly every country of Europe, and in England before 1185. For 140 years their history is that of the Crusades. They were persecuted for alleged heresy, and many tortured and burned in France 1307–14. The Council of Vienne suppressed the order May 1312 and transferred their goods to the Hospitalers.

**Knitting.** See HOSIERY.

**Knocker.** Metal bar or ring which took the place of the modern door-bell. It was arranged on a hinge so that when lifted it fell of its own weight resoundingly upon a metal plate. Much in vogue in early English times. Prized for their antiquity and beauty of design.

Knocker on the Palazzo Balbi-Valier, Venice.

**Knock-Knee.** Curvature of the legs, so that the knees hit together while walking.

**Knolles,** RICHARD, ab. 1545–1610. English author. *History of the Turks*, 1603.

**Knollys,** HANSERD, 1598–1691. English Baptist, minister at Dover, N. H., 1638–41. A London society, named from him, was founded 1845 to reprint early Baptist works.

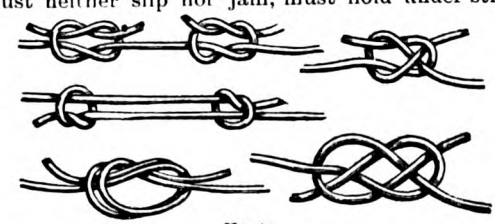
**Knorring,** ERIK OSKAR VON, b. 1822. Swedish author.

**Knorring,** SOFIA MARGARETTA VON, 1797–1848. Swedish novelist.

**Knot.** Nautical mile; 6,080 ft.; used at sea instead of the statute mile, as its length closely corresponds to one minute of latitude on the surface of the earth. Also, division of the log line, answering to one mile, in calculating a ship's velocity.

**Knotgrass.** *Polygonum aviculare.* One of the commonest of weeds; low spreading herb of very wide geographical distribution, of the natural family *Polygonaceæ;* known as Doorweed and Goose-grass. Coast-Knotgrass, *Polygonum maretinum*, is a similar plant, growing on sea beaches.

**Knots and Splices.** Listing, in his *Vorstudien zur Topologie*, 1847, became the founder of the theory of knots, but Tait, 1876–77, has written the most extensively on the subject. A knot must neither slip nor jam, must hold under strain and



Knots.

afterward be easy to untie. Nearly 200 different knots are used on shipboard. Splicing is resorted to when a knot is not desired. The ends of the ropes are unlaid, and then the strands are interlaced, cutting out some to prevent undue thickening.

**Knotweed.** All species of the genus *Polygonum*, weedy plants of wide geographical distribution.

**Knout.** Form of whip used in Russian punishments ab. 1500–ab. 1860; applied on the bare back, and often fatal.

**Knowledge.** Condition of the mind as aware of truth. We have presented to our consciousness a world of objects, external to ourselves, extended in space, existing in time, and changing by means of a reciprocal causality. These are the so-called categories of the intelligible world, and their interpretation carries with it the interpretation of the general nature of knowledge. The nature and validity of the categories and of the mind's knowledge of them become the central questions of philosophy. Psychology, on the other hand, accepting the facts as facts of consciousness, concerns itself only with the methods by which the mind becomes aware of them without regard to their objective validity. Knowledge implies more than mere sense perception; there is also discrimination and comparison as well as an element of conviction or belief based upon sufficient perceptive grounds. Knowledge is often classified according to its origin in the mental activities, and from this have sprung up various descriptive terms such as intuitive, a priori, a posteriori, abstract, empirical knowledge, etc. See INTELLECT.

**Knowles,** JAMES SHERIDAN, 1784–1862. Irish dramatist, cousin of R. B. Sheridan; in later life a Baptist preacher. His most important plays are *Virginius*, 1820; *Wm. Tell*, 1825; *The Hunchback*, 1832; and *Love*, 1839.

**Know-Nothing Party.** Organized 1853. It carried several Northern States 1854, and appeared 1856 as the American Party, with Fillmore as candidate for President; but its central idea, opposition to foreign citizenship, was overshadowed by the growth of antislavery sentiment, and it soon ceased to exist.

**Known Quantities.** Those which (1) are given by the conditions of the problem, (2) are ascertainable by experiment, or (3) enter as fixed elements in the law of relations found in the discussion. In elementary algebra, known quantities are designated by the first letters of the alphabet.

**Knox,** HENRY, 1750–1806. General in the American Revolution, distinguished at Trenton, Princeton, Germantown, and Monmouth; Sec. of War 1789–96.

**Knox,** JOHN, 1505–1572. Scottish reformer. He professed Protestantism 1545, was sent to the galleys by the French 1547, and delivered 1549. After some years in England and at Geneva, he returned to Scotland 1559, and thenceforth had the leading place in national affairs: in vain he was accused of treason 1562, and temporarily forbidden to preach in Edinburgh 1565. His convictions were intense, his indifference to side-issues absolute. Ruling by the force of a mighty will and purpose, he bore down all opposition, and his creed became that of his country.

**Knox,** JOHN JAY, LL.D., 1828–1892. Deputy Comptroller of U. S. currency 1867, Comptroller 1872–84. *U. S. Notes*, 1884.

**Knox,** THOMAS WALLACE, 1835–1896. American journalist; author of *The Boy Travelers* in many lands and volumes.

**Knox College.** At Galesburg, Ill.; opened 1842; coeducational and unsectarian. It has 30 teachers, nearly 700 students, and an endowment of $300,000.

**Knoxville.** Capital of Knox co., Tenn.; on the Tennessee; settled 1789; seat of Univ. of Tenn. It was abandoned by the Confederates and occupied by a strong Federal force under Burnside Sept. 1863; they were assaulted by Longstreet Nov. 17 and 29. The siege was raised Dec. 4, in consequence of Sherman's arrival with re-enforcements. Pop., 1890, 22,535; suburbs, ab. 14,000.

**Knuckle Bones.** Bones from the ankles of sheep, commonly employed as implements in games from remote classical antiquity. They are still used in various ways: as we use marbles, by children in Syria, where they are often weighted with lead; for jackstones, a custom in France; and as dice, throughout the Mohammedan East. For the last purpose, a natural pair, right and left, is commonly thrown, and as in classical antiquity, numerical values are attributed to each of their four sides. They may be regarded as the direct ancestors of cubical dotted dice.

**Knuckle Down.** Athletic feat, consisting of toeing a chalk-line, kneeling down, and rising without touching the hands to the floor or withdrawing the toes from the mark.

**Knut.** See CANUTE.

**Knutsford,** HENRY THURSTAN HOLLAND, BARON, b. 1825. M.P. 1874; Colonial Sec. 1887–92; Baron 1888.

**Knyphausen,** WILHELM, FREIHERR VON, 1716–1800. Russian general, serving the British in America 1776; in command of German auxiliaries 1777–82.

**Koala** (PHASCOLARCTUS). Native bear or sloth of Australia; arboreal marsupial, whose habits and feet are somewhat sloth-

Koala (*Phascolarctus cinereus*).

like. Only one young is born. The head is bear-like in appearance, the tail rudimentary. See CARPOPHAGA.

**Kobell,** FRANZ VON, 1803–1882. German mineralogist and poet. Prof. Munich 1826; inventor of the stauroscope. His *Tafeln zur Bestimmung der Mineralien* have been tr. into several languages and made the basis of similar tables by others.

**Kobolds.** German goblins, supposed to haunt mines and hoard treasure, but often kindly to men.

**Koch,** JOHANN FRIEDRICH WILHELM, 1759–1831. Counselor of the Consistory in Magdeburg. *Botanisches Handbuch zum Selbstunterricht*, 1797–98; *Dar natürliche System des Pflanzenreichs*, 1839; *Hortus dendrologicus*, 1853; *Dendrologie, Bäume, Sträucher, und Halbsträucher in Mittel-und Nordeuropa*, 1869.

**Koch,** ROBERT, b. 1843. Prof. Berlin 1885; discoverer of the tubercle bacillus 1882, and of the comma or cholera bacillus 1884; writer on etiology.

**Koch,** WILHELM DANIEL JOSEPH, 1771–1849. Prof. Erlangen. *Synopsis Floræ Germanicæ et Helveticæ*, 1837; *Taschenbuch deutschen und sweizer Flora*, 1848.

**Kochin.** See TUBERCULIN.

**Koch's Lymph** (TUBERCULIN). Sterilized, glycerine extract of the ptomains, resulting from the growth of the specific germ of consumption; prepared 1891 by Dr. R. Koch, and by him supposed to exert a curative action. A small dose hypodermically injected causes a fever (reaction) if tuberculosis is present, usually noticeable within 12 hours after injection. The disease is really aggravated by its use; the lymph is now applied to the detection of tuberculous cattle, which in many States are directed by law to be destroyed. In this way it is hoped that consumption among cattle may be eradicated, and that an important source of infection of mankind, through the milk from diseased cows, may be eliminated.

**Kock,** CHARLES PAUL DE, 1794–1871. French novelist of Dutch descent, once very popular. *Parisian Manners*, 1837. His works, collected 1844–45, filled 56 vols.—His son, HENRI, 1821–1892, wrote novels and plays.

**Kœlreuteria.** Small yellow-flowered tree of the Maple family, bearing large bladder-like pods, native of e. Asia; much planted for ornament.

**Koeppen,** VLADIMIR PETER, b. 1846. Russian-German meteorologist.

**Koeppen-Espy Law.** See DIURNAL INVERSION OF THE WIND.

**Koetsveld,** CORNELIS VAN, b. 1807. Dutch novelist. *Manse of Mastland*, 1843, tr. 1860.

**Kohinoor.** Indian diamond, owned by the British crown.

Original State.

Re-cut.

The Kohinoor Diamond.

Original wt. 900 carats, but reduced to 102.75 carats after being recut four times. It is rose-cut, and is valued at $600,000.

**Kohl,** JOHANN GEORG, Ph.D., 1808–1878. German traveler; writer on sundry lands of Europe and America.

**Köhler,** REINHOLD, b. 1830. Librarian at Weimar; literary antiquarian and critic.

**Köhler,** ULRICH, b. 1838. Prof. Berlin 1888; writer on Greek inscriptions.

**Kojiki.** Records of ancient matters; the scripture of Japanese Shintoism, tr. by B. H. Chamberlain.

**Kokscharov,** NICHOLAS, d. 1893. Russian mineralogist. *Materialien zur Mineralogie Russlands*, 11 vols., 1853–92.

**Kola Nut.** *Cola acuminata.* Fruit of the Kola tree, native of Africa. The seeds contain 2.35 per cent caffeine and .02 per cent theobromine. The taste is similar to that of the coffee-bean. As an adulterant the fruit of *Heritiera littoralis*, found in Molucca, is used, but it contains no caffeine.

Kola Nut.

**Kolar,** JOSEF JIRI, b. 1812. Bohemian actor, dramatist, and novelist.

**Kolbe,** HERMANN, 1818–1884. Assistant to Bunsen at Marburg 1842–47; associate editor of Leibig's *Dict. Chemistry*, 1847–51; prof. Marburg 1851–65, and Leipzig from 1865. Published many papers in the various journals.

**Kolima.** River of n. e. Siberia, flowing into the Arctic Ocean.

**Kolin.** Town of Bohemia, near which Frederick II. of Prussia was defeated by the Austrians under Daun, June 18, 1757. Pop. 12,000.

**Kollar,** JAN, 1793–1852. Hungarian poet; prof. Vienna 1849. *Slava's Daughter*, 1824.

**Kolliker,** RUDOLF ALBERT VON, b. 1817. Prof. of Anatomy at Würzburg 1847. *Human Histology*, 1852.

**Koltsoff,** ALEXEI VASILEVICH, 1809–1842. Russian lyric poet.

**Komorn.** Town of Hungary, on the Danube, 48 m. n.w. of Pesth; besieged thrice by Turks, and by Austrians Oct. 1848–Sept. 27, 1849. Pop. 13,000.

**Kona.** In the Sandwich Islands, strong southerly wind, with rain on the windward sides of mountains, interrupting the regular n. e. trades, and usually preceding a hurricane.

**Koni,** FEDOR, 1809–1879. Russian lyric poet, dramatist, translator, and biographer of Frederick II.

**Konieh.** City in Asia Minor, the ancient Iconium; capital of Seljuk sultans 1097–1293; taken by Barbarossa 1189. The Turks were defeated here by Ibrahim Pasha Dec. 21, 1832. Pop. 40,000.

**König,** FRANZ, M.D., b. 1832. Prof. Rostock, Germany, 1869; co-editor of the *Centralblatt fur Chirurgie*, 1880–85. *Tuberculose der Knochen und Gelenke*, 1884.

**König,** FRIEDRICH, 1774–1833. German printer, inventor of the steam press, patented 1810.

**König,** HEINRICH JOSEPH, 1790–1869. German historical novelist. *Shakespeare*, 1850.

**Koniggratz,** BATTLE OF. See SADOWA.

**Königinhof.** Village of Bohemia, n. e. from Prague; stormed by Hussites 1421. The Prussians defeated the Austrians here June 29, 1866.

**Konigsberg.** City of e. Prussia, on the Pregel near its junction with the Frische Haff, 20 m. from the Baltic; fortified 1626 and 1843. It has a large foreign and domestic trade. Its university, founded 1544, had, in 1895, 737 students; the philosopher Kant was connected with it from 1755. The library has ab. 225,000 vols. Pop., 1890, 161,666.

**Königstein.** Town of Saxony on the Elbe, 17 m. s. e. of Dresden, famous for the rock which behind it rises 878 ft. above

The Fortress of Konigstein.

the river, on which is built the bombproof fortress. Here the crown jewels and the treasury of the kingdom are stored in war time.

**Koninck,** PHILIP DE, 1619–1688. Dutch landscape and genre painter, as was his relative, SALAMON, 1609–1663.

**Konrad** OF WÜRZBURG, d. 1287. German poet.

**Koornhert,** DIEDRIK. See CORNHERT.

**Kootenay.** Branch of the Columbia, flowing through Montana, Idaho, and British Columbia. Length ab. 300 m.

**Kopeck.** Russian copper coin, 100 to the rouble.

**Kopisch,** AUGUST, 1799–1853. German poet, translator of Dante 1837.

**Kopp,** HERMANN, 1817–1892. Prof. Giessen and Heidelberg; historian of chemistry.

**Köppen,** PETER VON, 1793–1864. Russian historian and antiquarian, writing in German. *Taurica*, 1840.

**Köprili.** See KIUPRILI.

**Koptos.** Site on the e. Nile bank, between Thebes and Keneh; famed for the discoveries made 1894 by Petrie of prehistoric Egyptian remains.

**Korah.** Levite, cousin of Moses, who headed a rebellion, in which he and his adherents perished.

**Korais,** ADAMANTIOS, 1748–1833. Greek author, in Paris

from 1788; editor of several classics. *Atacta*, 5 vols., 1826–35. *Works*, 1881.

**Koran.** Sacred book of the Mohammedans; in Arabic; promulgated by Mohammed as dictated to him by the angel Gabriel at various times. It contains 114 suras or divisions, not numbered nor chronologically arranged. The matter is drawn largely from Jewish, but to some extent from Christian sources; Moses and Jesus are accounted prophets. English translations are by Sale 1734, Rodwell 1861, and Palmer 1880.

**Korasmia.** See KHIVA.

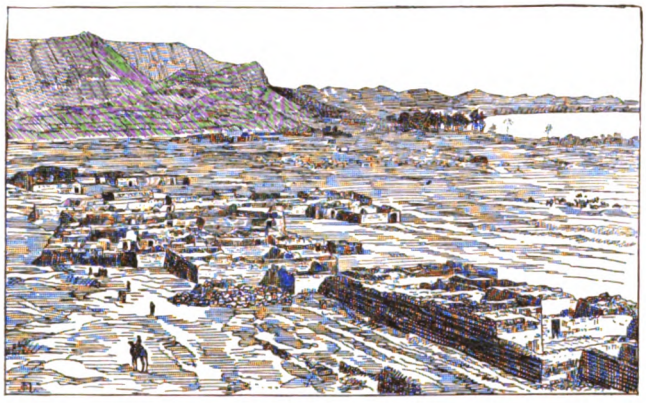
**Korea.** See COREA.

**Korean Language.** This resembles the Japanese and Mongolo-Tartar, has 14 consonants and 11 vowels, written in vertical columns, and is said to have originated in 4th century.

**Körner,** KARL THEODOR, 1791–1813. German patriot and lyric poet. *Lyre and Sword*, 1814, tr. 1839. His famous sword-song, probably the finest of its kind in all literature, was written a few hours before he fell in the war against Napoleon.

**Korolenko,** VLADIMIR GALAKTIONOVICH, b. 1853. Russian author, in Siberia 1879–85. *The Vagrant*, tr. 1888; *In Two Moods*, tr. 1891.

**Korosko.** Village of Upper Egypt on the right bank of the Nile, 112 m. s. s.w. of Assuan, half-way between the first



Korosko.

and second cataracts. It is the starting point for the caravans traveling across the Nubian desert to the Sudan.

**Kortenburg,** LAWS OF. Issued 1312. They terminated the contest between the cities and nobility of Brabant, and secured great privileges to the cities.

**Körting,** GUSTAV, b. 1845. Prof. Münster 1876, Kiel 1893. Romance philologist, as was his brother, HEINRICH KARL OTTO, 1859–1890, prof. Leipzig.

**Koschava.** Strong s. e. wind prevailing, especially at the time of the equinoxes, in e. Hungary.

**Koschwitz,** EDUARD, b. 1851. Prof. Greifswald; philologist; founder, with G. Körting, of *Zeitschrift fur neufranzösische Sprache*, 1879.

**Kosciusko,** MOUNT. Highest peak of the Australian Alps in New South Wales. Height 7,336 ft.

**Kosciusko,** TADEUSZ, 1746–1817. Polish general and patriot, distinguished in the American Revolution. He returned to Poland 1786; headed the national movement 1794; defeated the Russians at Raclawice, and defended Warsaw for two months; was defeated and taken prisoner at Maciejowice, Oct. 10, 1794; released 1796.

**Kosloff.** See EUPATORIA.

**Kossovo.** In Turkey, near the border of Servia; scene of Turkish victories over Servians 1389, and Hungarians 1448.

**Kossuth,** LOUIS, 1802–1894. Hungarian patriot, leader of the revolt of 1848; in exile 1849; in England and the U. S. 1851–52, where his eloquence is well remembered; in Italy from 1864. *Speeches*, 1852; *Letters*, 1862–72; *Memories of My Exile*, 1880–90.

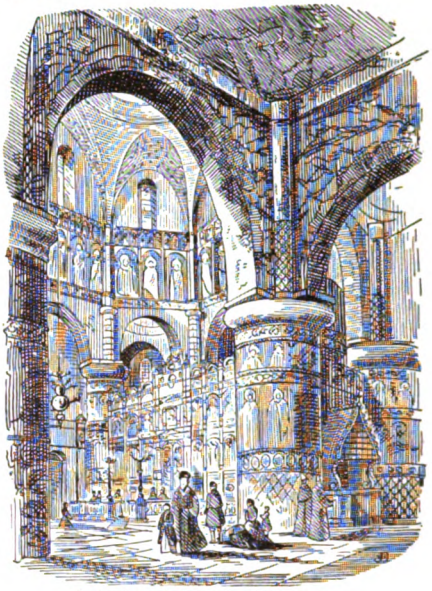
**Koster,** SAMUEL, ab. 1580–ab. 1650. Dutch dramatist.

**Köstlin,** JULIUS THEODOR, D.D., b. 1826. Prof. Breslau 1860, Halle 1870; biographer of Luther, 1875–82.

**Kostomaroff,** NIKOLAI IVANOVICH, 1817–1885. Russian poet, historian, and novelist.

**Kostra-Ibn-Looka,** or COSTHA BEN-LOUKA, ab. 900. Arabian scholar and translator; writer on philosophy, logic, and medicine.

**Kostroma.** Russian town on the Volga ab. 200 m. n. e. of Moscow. It is a very old city, and has 40 churches and a number of educational institutions. Imports corn, and exports timber and wooden goods, linen, leather, pitch, and tar. Pop. 32,000.



Interior of Church at Kostroma.

**Kotzebue,** AUGUST FRIEDRICH FERDINAND VON, 1761–1819. German dramatist, in the Russian service.—His son, OTTO, 1787–1846, explorer of the Pacific, gave his name to K. Sound.

**Koumiss.** Beverage of the Kalmucks and other Russian tribes, made by fermenting mare's milk. It contains 2 per cent of alcohol. It is also made in other localities, and more frequently by fermenting cows' milk and sugar.

**Kouns,** NATHAN CHAPMAN, b. 1833. American novelist. *Dorcas*, 1883; *Arius the Libyan*, 1883.

**Kovalevsky,** EGOR, 1811–1868. Russian traveler in Asia, official, and historian of the Crimean War. *Works*, 1868.

**Kovalevsky,** SOPHIE, or SOMA, 1853–1891. Russian mathematician, prof. Univ. Stockholm 1884. She received the prize of the French Academy 1888; its value being doubled on account of the great value of her Memoir. Her life, including an autobiography, tr. 1896, attracted wide attention. *Vera Barantzova*, tr. 1896.

**Kovno.** Town of w. Russia, acquired 1795. Pop. ab. 50,000.

**Koxinga,** or KWOH-SHING, d. 1663. Chinese pirate, who drove the Dutch from Formosa 1661, and the Chinese from their coasts 1662, abolishing commerce; killed by the Dutch in a naval battle.

**Koyundjik.** See NINEVEH.

**Kozlov,** IVAN, 1779–1840. Russian poet and translator.

**Kraevsky,** ANDREI, 1810–1889. Russian journalist, founder of the *Golos*, 1863.

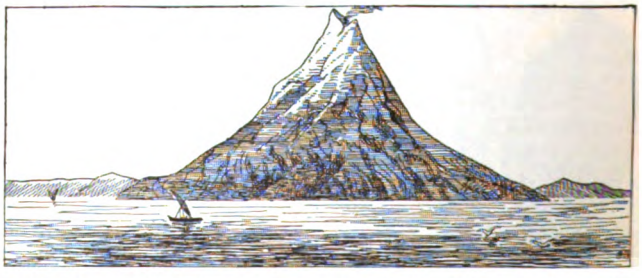
**Krafft,** ADAM, d. 1507. German sculptor, active in Nuremberg, where his fine reliefs of the Seven Stations of the Cross and other works may still be seen.

**Kraft-Ebing,** RICHARD VON, b. 1840. Prof. Gratz 1873–89, and since at Vienna; writer on psychiatry and psycopathia.

**Krajnik,** MIROSLAV, b. 1850. Bohemian poet, dramatist, and translator.

**Krajova.** Town of Roumania, on the Schyl; scene of a Turkish defeat 1397. Pop. ab. 40,000.

**Krakatoa.** Small volcanic island in the strait of Sunda,



The Island of Krakatoa, formerly in the Straits of Sunda, submerged during a Volcanic Eruption.

between Java and Sumatra. The volcano, 2,623 ft. high, was dormant from 1680 to May 13, 1883, when a series of eruptions

began, followed by a terrific explosion, Aug. 27, heard at a distance of 2,250 m., which blew away two-thirds of the island. This set in motion an ocean wave which swept over 163 villages and destroyed more than 36,000 lives.

**Kraken.** Enormous sea-monster, supposed to frequent the coast of Norway; described by Bp. Pontoppidan 1753.

**Krantz,** ALBERT, ab. 1450–1517. Rector Univ. Rostock 1482; Dean of Hamburg; historian of the Vandals, of Saxony, and of Scandinavia. His books were pub. 1520–48.

**Krantz,** JEAN BAPTISTE SÉBASTIEN, b. 1817. French engineer, architect, and author.

**Krapf,** JOHANN LUDWIG, 1810–1881. German missionary and explorer in central Africa 1837–55.

**Krapotkin.** See KROPOTKIN.

**Krasicki,** IGNACY, 1734–1801. Polish satirical poet.

**Krasinski,** VALERIAN, ab. 1780–1855. Polish historian, resident in London and Edinburgh.

**Krasinski,** ZYGMUNT NAPOLEON, 1812–1859. Polish poet and dramatist.

**Kraszewski,** JOSEF IGNACY, 1812–1887. Polish poet and historian.

**Kraus,** EBERHARD LUDWIG AUGUST, 1777–1845. German author of a medical lexicon, 1821–44. *Nosologie und Therapie*, 1838.

**Krause,** KARL CHRISTIAN FRIEDRICH, 1781–1832. German philosopher, privat-docent in Jena and Göttingen; Hegelian in main doctrines and tendencies. *Freemasonry*, 1810; *Ideal of Humanity*, 1812, tr. 1890; *System of Philosophy*, 1828.

**Krauth,** CHARLES PORTERFIELD, D.D., LL.D., 1823–1883. Ed. *Lutheran*, 1861–67; prof. Phila. Theol. Sem. from 1864, and Univ. Pa. 1868. *The Conservative Reformation and its Theology*, 1871.

**Kray,** or **Krajof,** PAUL, BARON VON, 1735–1804. Austrian general, engaged in Netherlands and on the Rhine 1793–95. He held chief command 1799, defeated Scherer twice in Italy, and took Mantua, but failed in the campaign against Moreau 1800.

**Krefeld.** See CREFELD.

**Krehbiel,** HENRY EDWARD, b. 1854. American musical critic, now of the *N. Y. Tribune*. *Technics of Violin Playing*, 1880.

**Kremenchug.** Town of s. Russia on the Dnieper. Pop. ab. 50,000.

**Kremer,** ALFRED VON, b. 1828. Austrian official and Orientalist. *Culture under the Caliphs*, 1875–77.

**Kremlin.** Citadel of Moscow; nearly triangular, in the center of the city on a hill 100 ft. above the Moskva, covering 98 acres. It is inclosed by a high stone wall, dating from 1492, but restored in this century, pierced by 5 gates and surmounted

The Kremlin.

by 18 towers. It contains the imperial palace, cathedrals, a monastery and convent, the arsenal, and the Great Bell, "Tsar of the Bells," 20 ft. in diameter at the rim, 19 ft. high, and weighing 430,000 lbs.: this was cast 1733, and broken 1737. The palace was burned 1813 and rebuilt 1831.

**Krestovsky,** VSEVOLOD, b. 1840. Russian novelist and poet.

**Kreutzer,** CONRADIN, 1780–1849. German composer, chiefly of operas, whose *Nachtlager von Granada*, 1834, still holds the stage.

**Kreuzer.** Copper coin long current in many German states, and in Austria till 1892, 100 to the florin; first minted ab. 1270 of silver in Tyrol.

**Kriegsspiel.** Tactical war game, showing military maneuvers on a contour map, introduced by von Reiswitz of the Prussian army in 1824.

**Krilof.** See KRYLOF.

**Krishaber,** MAURICE, M.D., 1836–1883. Hungarian laryngologist. *De la neuropathie cerebro-cardiaque*, 1873.

**Krishna.** In Hindu religion the 8th incarnation of VISHNU (q.v.), and the most beloved of their gods. He is Vishnu him-

Krishna and the Gopia.

self in human mold, and is represented as the meekest, tenderest, and most benevolent of beings.

**Krishna.** River of India, flowing e. into the Bay of Bengal. Length 800 m., drainage area 94,500 sq. m.

**Kronberg,** JOHANN JULIUS, b. 1850. Swedish historical and figure painter.

**Kronos.** See SATURN.

**Kropotkin,** PETER, PRINCE, b. 1842. Russian Nihilist and scientist, sprung from an ancient family and brought up at court. In 1872 he came under the influence of the "International," and began to devote himself largely to agitation against existing social institutions. He was arrested in Russia 1874, escaped 1876 to Switzerland, was expelled thence 1881, was imprisoned in France 1883–86, and has since lived in London. His work as a geographer has been considerable. *War*, 1885, tr. 1886; *In Russian and French Prisons*, 1887.

**Kröyer,** PETER SEVERIN, b. 1851. Norwegian painter.

**Krüdener,** BARBARA JULIANA (WIETINGHOFF), BARONESS VON, 1764–1824. Russian enthusiast, who, turning from a worldly life ab. 1806, exerted much influence for a time, but was soon driven from France and the German states and forced into retirement. *Valerie*, 1803; *Conversations*, 1818.

**Krueger,** S. J. PAUL. Pres. S. African Republic since 1883.

**Krug,** WILHELM TRAUGOTT, 1770–1842. Prof. Königsberg 1804, and Leipzig 1809–34; prolific writer. *Fundamental Philosophy*, 1803; *Works*, 12 vols., 1830–41.

**Krüger,** KARL WILHELM, 1796–1874. German ed. of Greek classics: author of a Greek grammar. *Studien*, 1837–51.

**Krul,** JAN HERMANSZOON, 1602–ab. 1670. Dutch poet.

**Krummacher,** FRIEDRICH ADOLF, 1768–1845. Pastor at Bremen. His *Parables*, 1805, tr. 1824, were long popular.—His son, FRIEDRICH WILHELM, 1796–1868, pub. *Elijah*, 1836; *Solomon*, 1838; *David*, 1867, and an autobiography, 1869.

**Krung-Kao,** or AYUTHIA. City of Siam, on the Meinam, mostly composed of floating dwellings; founded in the 14th century; once the capital. Pop., 1891, ab. 50,000.

**Krupp,** ALFRED, 1812–1887. Owner of the large iron-works at Essen, Prussia, with 20,000 workmen; inventor of sundry improved guns and processes for making them; he was the first to make heavy guns entirely of steel.

**Krupp Gun.** The breech mechanism is the distinguishing feature of this. A wedge, with a flat surface in front and a cylindrical surface in rear, slides horizontally in a transverse slot in the jacket of the gun and closes the breech. The gas check is a Broadwell ring of steel, fitting into the rear end of the bore, and capable of expanding under the pressure of the powder gas.

**Krusenstern,** ADAM JOHANN VON, 1770–1846. Russian admiral and author; explorer of the n. Pacific 1803–6. *Voyage*, 1810–12, tr. 1813; *Hydrography*, 1819; *Atlas of the Pacific*, 1824.

**Krylof,** IVAN, 1768–1844. Russian fabulist of the highest merit and popularity. His success began 1805. His other writings are of little value.

**Kublai Khan.** Grandson of Jenghiz Khan; sovereign of Tartary 1259; Emperor of China by 1280, and founder of the Mongol dynasty. He enlarged the Empire by conquests in all directions until it touched the Arctic Sea, the Euxine, and the Straits of Malacca. His splendors were described by Marco Polo and imagined by Coleridge.

**Kuchenmeister,** GOTTLOB FRIEDRICH HEINRICH, M.D., b. 1821. German physician who investigated the nature and development of *Entozoa*. *Animal and Vegetable Parasites of the Human Body*, 1855.

**Kudu.** African Antelope, of brownish color with vertical white stripes; hunted for its hide, and nearly exterminated at

Kudu.

Cape Colony, but abundant further north. The male is 3 ft. high at the shoulders and has spirally-twisted horns 4 ft. long.

**Kücken,** FRIEDRICH WILHELM, 1810–1882. Admired German composer, especially of sentimental songs.

**Kuenen,** ABRAHAM, D.D., 1828–1891. Dutch biblical critic, prof. Leyden 1853. His *Origin of O. T. Books*, 1861–65; *Israel*, 1870; *The Prophets*, 1875; and *National Religions*, 1882, were all tr., and exerted great influence.

**Kuenlun Mountains.** Range on the n. border of the plateau of Thibet, separating it from Turkestan. Its peaks reach heights exceeding 20,000 ft., and it has immense glaciers.

**Kufic.** See CUFIC.

**Kugler,** FRANZ THEODOR, 1808–1858. Prof. Berlin 1833; historian of art.

**Kuhn,** FRANZ FELIX ADALBERT, 1812–1881. Prof. Berlin gymnasium 1856; writer on comparative philology and mythology.

**Kuhnau,** JOHANN, 1667–1722. German musician, immediate predecessor of J. S. Bach as Cantor of St. Thomas School in Leipsic; one of the earliest writers of SONATAS (q.v.).

**Kühne,** WILHELM, b. 1837. Prof. Heidelberg 1871; writer on physiology.

**Kühner,** RAPHAEL, 1802–1878. German author of Greek and Latin grammars.

**Kühnöl,** CHRISTIAN GOTTLIEB, 1768–1841. Prof. Giessen from 1801; commentator. *Historical Books of N. T.*, 4 vols., 1807–18, tr. 1837.

**Ku-Klux Klan.** Secret organization in the Southern States 1866–71; said to have numbered 550,000 members, bound together by solemn oaths. It originated in the chaotic social and political conditions which followed the war; the intimidation and murder of negroes and of whites of union sympathies were traced to it.

**Kukolnik,** NESTOR, 1809–1868. Russian playwright, novelist, and journalist.

**Kukuljevic-Sakinsky,** IVAN, b. 1816. Croatian writer, especially on historical subjects.

**Kullberg,** KARL ANDERS, 1813–1857. Swedish poet, journalist, and historical writer.

**Kulm.** Village of Bohemia, scene of a destructive defeat of 40,000 French under Vandamme by the Allies, Aug. 29–30, 1813.

**Kulturkampf.** Attempt to control the R. C. schools in Prussia and the German Empire, 1871–78, by the expulsion of the Jesuits and others, and the FALK LAWS (q.v.); resisted by the clergy and resented by Pius IX.

**Kumamoto.** Japanese city 50 m. n. e. of Nagasaki, with celebrated fortress of enormous stones. Center of Higo rice trade. Pop. 47,600.

**Kumquat.** *Citrus japonica*. Small tree of the Orange family, native of w. Asia; cultivated for its fruit, which is made into preserves.

**Kundt's Figures.** Series first described by Kundt of Strasburg; produced when air or other gas is thrown into vibration in a glass tube containing a light powder, such as lycopodium or finely divided silica. If such a glass tube, three or four feet long, closed at the ends and filled with air, be held at its middle point and caused to vibrate longitudinally by drawing a wet cloth along it, a series of dust-heaps will be produced in the tube corresponding to the nodal points. These will be the more sharply defined the more closely the wave length in air of the note given by the tube approximates to an aliquot part of the length of the tube. Since the distance between two consecutive heaps represents half the wave length of the given sound in air, and the length of the tube itself represents half the wave length for the same sound in glass, the ratio of the two is the relation of the velocities of sound in air and in glass. If the tube be filled with hydrogen or any other gas, the ratio of the distances between the consecutive dust-heaps under these conditions to those obtained with air is obviously the relation of the velocity in the gas employed to that in air.

**Kunersdorf.** Village of Prussia, 4 m. e. of Frankfort-on-the-Oder. Frederick the Great was signally defeated here by the Austrians under Loudon Aug. 12, 1759.

**Kunigunde,** ST., d. 1030. Queen of Henry of Bavaria, Emperor 1014–24; founder of a convent near Cassel; canonized 1200.

**Kunkel,** JOHANN, 1630–1702. German alchemist, employed by various princes, particularly Charles XI. of Sweden.

**Kunth,** KARL SIGISMUND, 1788–1850. Prof. of Botany in Berlin 1820. *Mimosees et autres plantes légumineuses du Nouveau Continent*, 1819–24; *Synopsis plantarum*, 1822–25; *Handbuch der Botanik*, 1831; *Enumeratio plantarum omnium hucusque cognitarum*, 1833–50.

**Kunz,** GEORGE FREDERICK, b. 1856. American mineralogist.

**Kunze,** JOHN CHRISTOPHER, D.D., 1744–1807. Pastor in New York from 1784; prof. Columbia Coll. 1784–87 and 1792–99; editor of the first English Lutheran hymn-book, 1795.

**Kupetzky,** JOHANN, 1667–1740. Hungarian painter.

**Kupffer,** ADOLPH THEODOR, 1799–1865. German mineralogist and physicist, long co-laborer with Haüy in crystallographic researches. His later years were spent in Russia.

**Kurbskii,** ANDREI MIKHAILOVICH, 1528–1588. Russian author, who served in the army of Ivan the Terrible, and of whom he wrote a history, which is probably the earliest history in the Russian language.

**Kurdistan.** Ethnographic region of w. Asia mostly between 34°–40° N. and 39°–47° E. In the southern part the population is exclusively Kurdish, but in the n. there is also a large Christian population. Area 74,000 sq. m. Pop. ab. 2,500,000.

**Kurds.** Inhabitants of the region between the Caucasus and Persia; probably of Medeo-Persian descent. Their complexion is light, the eyes blue or gray. There are two castes, warriors and farmers. Their religion is a mixture of paganism

and Mohammedanism. They are broken up into warring sects that hate the Christians and one another. They number ab.

Kurds.

2,500,000, and are independent, fierce, and notorious as robbers and persecutors of the Armenians. Their language, called Kermanji, is derived from an old Persian dialect.

**Kürenberg.** German minnesinger of the 12th century.

**Kuriles.** Twenty-six islands between Kamchatka and Yezo; transferred by Russia to Japan 1875; sparsely inhabited, and valuable chiefly for their fisheries.

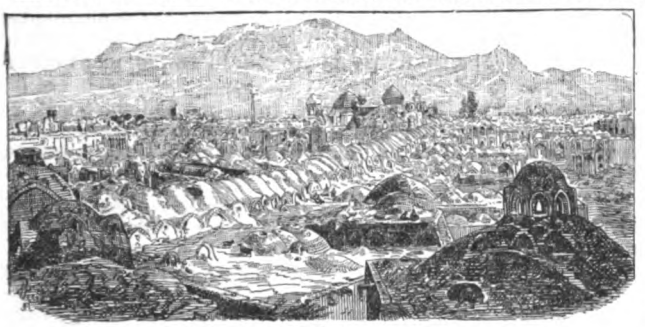
**Kurisches Haff.** Lagoon of e. Prussia, connected with the Baltic. Length 61 m.

**Kurochkin,** VASILI, 1831–1874. Russian journalist and translator; founder of *Iskra*, 1864.

**Kurtz,** BENJAMIN, D.D., LL.D., 1795–1865. Ed. *Lutheran Observer*, 1833–61; leader of one wing in that communion.

**Kurtz,** JOHANN HEINRICH, D.D., 1809–1890. German Ch. historian, prof. at Dorpat 1850–70.

**Kushan.** Town in n. e. Persia, the scene in 1893 of an



Kushan.

earthquake, which completely destroyed the town and all the villages within 7 miles of it, killing ab. 12,000 people. From Nov. 17 to Nov. 24 there were counted 160 distinct shocks. Pop. 12,000.

**Kuskokvim.** Large river of Alaska, flowing s. w. into Behring Sea.

**Küstrin,** or CUSTRIN. Town of Prussia, on the Oder; a fortified town 1535–43; taken and burned by the Russians Aug. 22, 1758; surrendered to the French 1806; restored 1814. Pop. 1890, 16,600.

**Kutter's Formula.** Devised 1877 by W. R. Kutter, a Swiss civil engineer, for computing the mean velocity of water flowing in a channel. It has the great merit of including a coefficient of roughness which varies according to the character of the bed and sides of the channel.

**Kutúsoff,** MICHAEL, 1745–1813. Russian general, distinguished in the war against Napoleon; victor at Dürrenstein 1805, defeated at Borodino Sept. 7, 1812; prominent in the pursuit from Moscow; Prince of Smolensk 1813.

**Kützing,** FRIEDRICH TRAUGOTT, b. 1807. Prof. Nordhausen 1835. *Algarum Germaniæ*, 1833–36; *Phycologia germanica*, 1845; *Species Algarum*, 1849; *Grundzüge der philosophischen Botanik*, 1851–52.

**Kwan Ti.** God of War; most popular of the Chinese deities, now worshiped throughout the Empire; b. 2d century. He attained great military distinction, and was canonized 12th century. In 1594 he was raised to the rank of Ti or God.

**Kwan Yin.** Goddess of Mercy of Chinese Buddhism; generally considered in China as holding the first rank in the Buddhist pantheon. Her name "contemplating sounds" is a mistaken translation of the Sanskrit *Avalôkitêçevara*. The Chinese furnish a legendary biography of the goddess, and it is probable that she was a native deity around which Buddhistic legends have been woven.

**Kyanizing.** Process of impregnating timber with bichloride of mercury to prevent decay; invented 1832 by Kyan. It is effective, but expensive. Three to five pounds per 1,000 ft. board measure are used.

**Kyanophyll.** Bluish green pigment, separated from chlorophyll by treatment with alcohol and benzol.

**Kyd,** THOMAS. Early English dramatist. *Spanish Tragedy*, 1599.

**Kymric Literature.** See WELSH LITERATURE.

**Kymry.** See CYMRY.

**Kynaston,** HERBERT, D.D., 1809–1878. Prebendary of St. Paul's 1853; hymnist and translator.

**Kyrie Eleison.** (Gr. "Lord have mercy!") Prayer in the Mass, between the Introit and Gloria; introduced by Gregory I. (590–604), who also added the phrase, *Christe eleison*, and ordered that the supplication should be sung by the congregation in response to the priest; also that the *Kyrie*, the *Christe*, and again the *Kyrie*, be sung three times. This triple arrangement contains a mystical allusion to the Trinity, and is generally observed by composers in their settings of the Mass, though they do not limit themselves to a threefold utterance of each phrase. In the English Ch. the response to the Commandments, "Lord have mercy upon us, and incline our hearts to keep this law," is called the "Kyrie."

**Kyrle,** JOHN, 1664–1724. Scottish philanthropist, celebrated by Pope as "the Man of Ross." A Kyrle Society, for artistic missionary work, was formed 1875 in London.

**Kyoto.** See KIOTO.

# L

**Laager.** Ox-wagons placed around a space inclosed for encampment or defense in S. Africa.

**Laaland.** Danish island in the Baltic, s. of Zealand. Area 445 sq. m.; pop. ab. 70,000.

**Laale,** PEDER. Compiler of Danish proverbs, pub. 1506.

**Labadie,** JEAN DE, 1610–1674. French Jesuit till 1639, Protestant 1650; founder of a short-lived Dutch sect, the Labadists.

**Laban.** Uncle of the patriarch Jacob, and father of his wives, Leah and Rachel.

**Labarraque's Disinfectant.** SODIUM HYPOCHLORITE (q.v.), in solution. Named after a Parisian druggist.

**Labarum.** Roman military standard, especially that of Constantine, which bore a cross and the first two Greek letters of name Christ, *X P*.

**Labat,** JEAN BAPTISTE, 1633–1738. French missionary and traveler in W. Indies. *Voyage*, 1722–42.

**La Bédollière,** ÉMILE GIGAULT DE, 1812–1883. French journalist and historical writer. *Mère Michel*, 1851.

**Label.** Piece of paper, or other material, to be attached to a manufactured article and bearing an inscription. It may be registered in the Patent Office, and thus protected from infringement, at a charge of $6.

**Label.** See HOOD MOLDING.

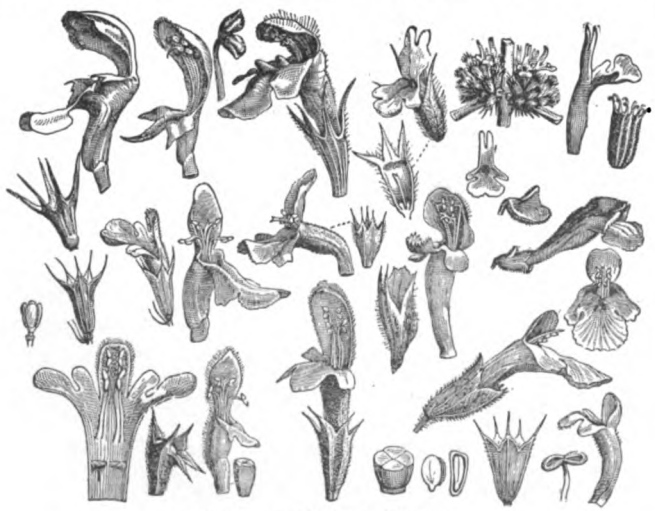
**Labellum.** Front petal or lip of an orchid flower.

**Label Termination.** Ornament which concludes a label molding.

**Laber,** HADAMAR VON, d. ab. 1450. German poet.

**Laberius,** DECIMUS, 107–43 B.C. Roman writer of mimes, a species of comedy. From remaining fragments he is ranked high, perhaps next to Plautus.

**Labiatæ.** Natural family of flowering plants, of the class *Angiospermæ*, sub-class *Dicotyledons*, and series *Gamopetalæ*, comprising ab. 142 genera and 2,700 species, distributed throughout all parts of the earth; called the Mint family.



Specimens of Labiate Flowers.

**Labiate.** Term for lipped corollas of many of the Mint family (*Labiatæ*), and some other plants; also called Bilabiate.

**Labiche,** EUGÈNE MARIN, 1815–1888. French dramatist, Academician 1880. *Frisette*, 1846; *La Clef*, 1877; Works, 10 vols., 1879.

**Labienus,** TITUS, d. 45 B.C. 1. Roman general, who fought under Cæsar in Gaul, and then against him; killed at Munda in Spain. 2. Orator in Augustus' reign. His name was used in a lampoon on Napoleon III. 1865.

**Labio-glosso-laryngeal** (or LABIO-GLOSSO-PHARYNGEAL) **Paralysis.** Fatal disease in which there is progressive paralysis and atrophy of the muscles of the lips, tongue, and throat. Death results from involvement of muscles necessary to life.

**Labium.** 1. Lower lip of insects, comprising the central and distal parts of the second maxillæ. 2. Lower lip of a flower of the Mint family.

**Lablache,** LUIGI, 1794–1858. Italian bass singer, of French descent; originally buffo; star of the opera in Paris, London, and St. Petersburg, 1830–52. He wrote a *Méthode de Chant*.

**La Boétie,** ÉTIENNE DE, 1530–1563. French author and translator, praised by Montaigne. His works were reprinted 1892.

**Labor.** Parturition or bringing of a child into the world.

**Labor,** IN ECONOMICS. Efficient human exertion. Looked upon from the point of view of production, it is one of the agents in the creation of wealth; from that of exchange, a factor in the cost of production; in relation to distribution, it is the recipient of wages.

**Labor,** RIGHT TO. Claim that it is one of the fundamental duties of governments to furnish an opportunity to labor and earn wages to all citizens unable to obtain employment otherwise.

**Laboratory.** Establishment for chemical, physical, or other scientific research, or for the manufacture of chemicals; department of an arsenal for putting up combustible stores, or for testing smokeless and gun powders, nitroglycerines, etc.

**Labor Day.** First Monday in Sept.; first observed 1887, now a holiday in most of the U. S. May 1 is similarly observed in some countries of Europe.

**Laborde,** ALEXANDRE LOUIS JOSEPH, COMPTE DE, 1774–1842. French soldier and official, author of two extensive works on Spain, 1807–27.

**Labor-Time Money.** Kind of currency proposed by Rodbertus and later socialistic writers. Its value was to be the number of hours' labor on the part of the holder which it represented. It would be exchangeable for any product of a similar number of hours' labor, the price of all things being reduced to the amount of labor involved in their production.

**Labouchere,** HENRY, b. 1831 English radical, M.P. since 1865; ed. *Truth*. *Diary in Paris*, 1871.

**Laboulaye,** ÉDOUARD RENÉ, 1811–1883. Prof. Coll. de Fr. 1849, Senator 1875. *Hist. Landed Property*, 1839; *Roman Criminal Law*, 1845; *Political Hist. U. S.*, 1855–66; *U. S. and France*, 1862; *Paris in America*, 1863. His *Fairy Tales*, with *Abdallah*, were tr. 1866.

**Labourdonnais,** BERTRAND FRANÇOIS MAHÉ DE, 1699–1753. French naval officer; Gov. of Mauritius and Isle de Bourbon 1734–40; commander of a fleet in the E. Indies 1740–46, where he did much damage to the English; victor at Madras 1746; imprisoned 1748–51. *Mémoires*, 1850.

**Labrador.** Sterile peninsula of Canada between the Atlantic and Hudson's Bay; discovered (according to tradition) by Northmen ab. 1000, and by Cabot 1497. The Arctic current which washes its shores renders the climate very cold; at the

mission stations the mean annual temperature varies from 22° to 27°. Its wealth lies chiefly in its fish, the annual catch

Labrador Fishermen.

approximating $5,000,000. Area ab. 420,000 sq. m.; pop. ab. 13,000, Cree Indians in the interior, and Eskimos and French Arcadians on the coast.

**Labrador Duck** (CAMPTOLAIMUS LABRADORIUS). See ANATINÆ.

**Labradorite.** Calcium, sodium, aluminium silicate, belonging to the feldspar group of minerals, intermediate between albite and anorthite, found chiefly in Labrador. It is a common ingredient in crystalline eruptive rocks, associated with amphibole and pyroxene. A polished surface frequently shows a beautiful play of colors.

**Labrador Tea.** Shrubs of the genus *Ledum*, of the Heath family, inhabiting marshes and high mountains in the cooler portions of the n. hemisphere.

**Labretifery.** Habit of inserting labrets or lip-ornaments, common to many barbarous nations.

**Labridæ.** The most noted member of this family of fishes is the Tautog or Blackfish, which ranges from Me. to S. C., coming into shallow waters during warm weather. It is said to hibernate; 100 or more fishermen are engaged on the shores of New England in its capture; the average catch per man for a season is nearly 6,000 lbs. See ACANTHOPTERI.

**Labrouste,** HENRI PIERRE FRANÇOIS, 1801–1875. Parisian architect.

**Labrum.** Upper lip of insects. It articulates with the clypeus above.

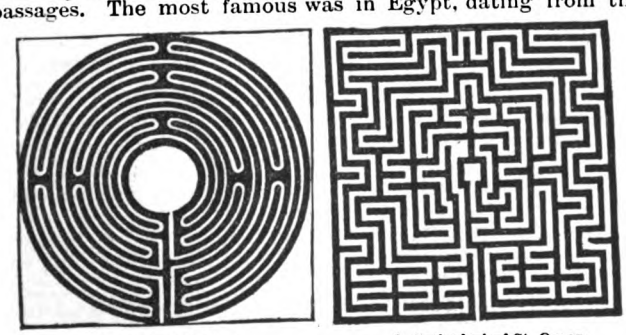
**Labruyère,** JEAN DE, 1645–1696. French author, Academician 1693. His *Caractères*, 1688–96, was in part tr. from Theophrastus.

**Labuan.** Island n. of Borneo, belonging to Great Britain since 1846. Area 30 sq. m.; pop., 1891, 5,853.

**Laburnum.** *Cytissus laburnum.* Small, showy, yellow-flowered tree of the natural family *Leguminosæ*, native of central Europe; much planted for ornament.

**Labyrinth.** Internal ear.

**Labyrinth.** Large building or excavation, with intricate passages. The most famous was in Egypt, dating from the



1. Cathedral of Sens. 2. Cathedral of St. Omer.

Labyrinths of Cathedrals.

12th Dynasty, ab. 3000 B.C., said to have contained 3,000 chambers, and used as a meeting-place for the Egyptian Nomes. It was in the Fayum, and is now utterly ruined, but the foundations have been excavated. It was visited and described briefly by Herodotus. There were also Labyrinths in Samos and (at least mythically) in Crete, the latter much famed, in mythology.

**Labyrinth.** Ore-dressing apparatus, consisting of a series of launders or troughs, varying in width, depth, and inclination, through which the pulp from a stamp-mill is conducted, and in which a partial concentration is effected, the richer portions being retained at the head or upper end, while the poorest parts run to waste from the lower end.

**Labyrinthodonts.** Extinct scale-covered amphibians, having teeth with a labyrinthine arrangement of the dentine and cement; first appearing in the Carboniferous and found of gigantic size in the Triassic.

**Labyrinthula.** Protozoan animal, consisting of a granular protoplasm, in which are numerous spindle-shaped nuclear bodies. Slender threads of protoplasm branch out irregularly, along which these bodies creep. It incrusts alga stems.

**Labyrinthulidea.** Sub-class of *Filosa*, including LABYRINTHULA (q.v.).

**Lac,** or SHELLAC. Resinous substance, produced as an exudation on certain trees, which are punctured by an insect; used for the preparation of varnishes.

**Lac,** or LAKH. In India, 100,000 rupees, originally worth £10,000, now about half as much.

**Lacaille,** NICOLAS LOUIS DE, 1713–1762. French astronomer, said by Lalande to have made more observations and calculations than all others of his time combined. His work was of a high order.

**La Calprenède,** GAUTIER DE COSTES, CHEVALIER DE, ab. 1610–1663. French romancer and dramatist. *Cassandre*, 10 vols., 1642–65; *Cléopâtre*, 12 vols., 1647.

**Laccadives.** Group of small coral islands in Arabian Sea, lat. 10° to 14° N. Area 744 sq. m.; inhabitants are of Hindu descent; pop., 1891, 14,410.

**Laccolite.** Mass of trap that has been forced up from below and has formed a lenticular sheet over and around the orifice.

**Lace.** When lace was first made we cannot say, but point-lace, the earliest known, was made in the nunneries ab. 1500. This was wrought upon a linen pattern as its foundation. Pillow-lace is claimed as the invention of a German woman of the 16th century. Machine-made lace, chiefly carried on in Nottingham, Eng., has superseded in large part the old hand-made, and lowered prices very considerably. See HONITON.

Lacemaking.

**Lacedæmon.** See SPARTA and LACONIA.

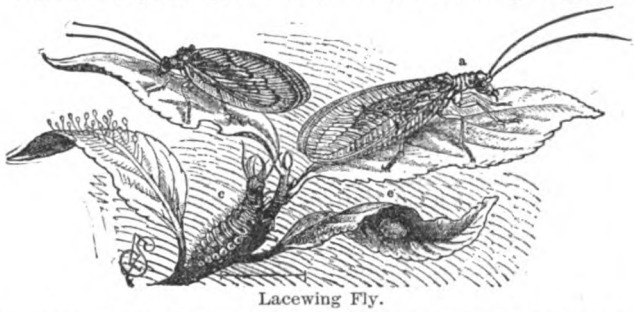
**Lacépède,** BERNARD GERMAIN ETIENNE DE LA VILLE, COMTE DE, 1756–1825. French Senator 1799, Peer 1814; writer on natural history. *Reptiles*, 1789; *Poissons*, 6 vols., 1798–1803; *L'Homme*, 1827; *Hist. Europe*, 18 vols., 1826.

**Lace-Pod.** Herbs of the genus *Thysanocarpus* of the Mustard family, natives of California, bearing flattened, winged fruits with perforated margins.

**Lacertilia** (SAURII, LIZARDS). Order of Reptiles characterized by having a non-distensible mouth, the facial and jaw-bones being firmly articulated with one another. The body is elongated and scaly, as in Snakes. Limbs are usually present, but there is always a rudiment of the pectoral girdle, even if limbs are absent. A tympanic cavity is generally present, movable eyelids, and a urinary bladder. The dentition, as a rule, is acrodont in Old World forms and pleurodont in those of the New. Most are harmless, and feed on vermin and insects. Some are hunted for food (*Iguana*). Some are viviparous (*Anguis*). The following sub-orders are included: *Annulata*, *Vermilinguia*, *Crassilinguia*, *Brevilinguia*, and *Fissilinguia*. Gigantic fossil forms occur, especially several Saurians that form distinct orders, as *Proterosauria*, *Thecodontia*, *Dinosauria*, *Ornithoscelida*, and

*Pterosauria.* These forms connect with Birds, with Hydrosaurians, and some suggest Mammals in their structure.

**Lacewing Fly** (CHRYSOPA). Small four-winged fly, whose



Lacewing Fly.

larvæ resemble a lady-bird beetle in shape though not in color; they destroy plant-lice and the larva of the plum curculio.

**Lachaise,** FRANÇOIS D'AIX DE, 1624–1709. French Jesuit, confessor of Louis XIV. 1675. His garden was turned 1804 into the Père Lachaise cemetery.

**Lachambeaudie,** PIERRE, 1807–1872. French poet. *Fables,* 1839.

**Laches.** Failure to exercise such diligence in enforcing a right as the law requires.

**Lachine Canal.** It connects the harbor of Montreal with Lachine on Lake St. Louis, 8½ m. long. It was advocated in 1791, construction started 1821, opened for navigation 1826, and enlarged 1875, so that the lock dimensions are 275 ft. long by 45 wide and 14 deep.

**Lachlan.** River in New South Wales, flowing w. into the Murrumbidgee. Navigable in the rainy season by shallow steamers. Length 700 m.; drainage area 27,000 sq. m.

**Lachmann,** JOHANN GOTTFRIED JACOB, 1772–1848. German critic in both ancient and modern philology, particularly in early German meters; editor of Lucretius, the *Nibelungenlied,* and many other texts.

**Lachmann,** KARL KONRAD FRIEDRICH WILHELM, 1793–1851. Prof. Berlin 1825; authority in both German and classical philology; editor N. T. 1831–'42–'50, Lucretius, 1850, and many other authors.

**Lachner,** FRANZ, 1803–1890. Chapelmaster in Vienna 1828–34, and at Mannheim 1834–36; director of the court opera, church music, court orchestra, and the concerts of the Musical Academy in Munich 1836–68. Among his compositions are seven orchestral suites, eight symphonies, four operas, two oratorios, and a large number of masses, chamber pieces, and songs.

**Lachrymal Gland.** Almond-shaped gland in the upper and outer portion of the orbit, which secretes the tears, which pass from the eye into the nose through a small canal, lachrymal duct, which begins at the inner angle of eye.

**Lacinia.** Lobus or lamina internus of the first maxillæ of insects, the more median of the two leaf-like pieces borne by the stipes.

**Lacistemaceæ.** Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Dicotyledons,* including 1 genus and ab. 16 species, confined to the American tropics.

**Laclède,** PIERRE LIGUESTE, 1724–1778. French trader from New Orleans, founder of St. Louis, Mo., 1764.

**Lacmoid.** See RESORCIN BLUE.

**La Condamine,** CHARLES MARIE DE, 1701–1774. French savant, in Peru 1735–44 to measure the arc of the meridian. *Voyage,* 1745–51.

**Laconia.** Ancient country of s. e. Greece, defended by mountains on n. and w., and by lack of harbors on the coast line; occupied by Dorians and their descendants, Spartans.

**Laconia.** Original name of the country between the St. Lawrence, Merrimac, and Kennebec Rivers, included in a grant by James I. to Gorges and Mason, Aug. 1622.

**Lacordaire,** JEAN BAPTISTE HENRI, 1802–1861. French priest, Dominican from 1840; famous for eloquence; in politics a strong liberal. *Conferences,* 1844–51.—His brother, JEAN THÉODORE, 1801–1870, was an eminent entomologist. *Coleoptera,* 1854–70.

**Lacquer.** Varnish of varying composition containing LAC (q.v.), used to preserve the surface of metals and wood from corrosion and discoloration. Japanese lacquer-ware is lacquered with the juice of the varnish-tree, *Rhus vernicifera.* Vessels lacquered with this are used for hot soups and liquors without any danger of injuring the lacquer. Various pigments are used in coloring the lacquer. The art of lacquering is a very ancient one and the process tedious, specimens of old work bringing fabulous prices.

**Lacretelle,** JEAN CHARLES DOMINIQUE, 1766–1855. French journalist, prof. Univ. Paris 1809–53, Academician 1811; historian of the Huguenot wars, the 18th century, the Revolution, and later times.—His brother, PIERRE LOUIS, 1751–1824, was a noted lawyer, editor, and author.

**Lacroix,** PAUL ("BIBLIOPHILE JACOB"), 1806–1884. French novelist and historical writer.—His brother, JULES, 1809–1887, was a dramatist and translator.

**Lacroix,** SYLVESTRE FRANCOIS, 1765–1843. Prof. Coll. de France; writer on Calculus, 1797–1800.

**Lacrosse.** Game played with a small ball and a bent stick. Upon the latter, from the curve to the straight part, is strung a net, by means of which the ball is caught and thrown. The game was a favorite sport of the Indians, and was first seen by European settlers in Canada when the French explored the country along the St. Lawrence; the Algonquin tribe were the leaders in the game. The fundamental principle is that of football; namely, to attempt to put the ball through the opponent's goal

The Game of Lacrosse—Positions of the Players.

while defending one's own goal from a like assault. It is played on a level field with a rubber ball of about eight inches in circumference, while the sticks used are of any length to suit the player. The distance between the goals should be at least 125 yards, and these goals should be six feet high and six feet wide. There are 12 players on a side. The match is decided by a majority of goals made within a specified time. The officials consist of a referee and two umpires, one at each goal.

**La Crosse.** City of La Crosse co., Wis., on the Mississippi at the mouths of Black and La Crosse rivers. Pop., 1890, 25,090.

**Lacryma Christi.** Sweet wine made of grapes grown on Mt. Vesuvius.

**Lactantius,** LUCIUS CÆLIUS FIRMIANUS, ab. 250–ab. 330. Christian rhetorician, who came from Africa to Nicomedia 301, and ab. 313 to Gaul; author of 7 books of *Divine Institutes* and other works, noted for pure Latinity. *Deaths of Persecutors.*

**Lactarine.** Commercial preparation of caseine, used in fixing colors in cotton printing; powder, insoluble in water, decomposed by steam, forming an insoluble caseine, thus holding a pigment upon a fiber.

**Lacteals.** Lymphatic vessels which convey the chyle from the intestines to the thoracic duct.

**Lactic Acid.** $CH_3.CHOH.COOH$. $\alpha$-hydroxyproprionic acid or ethylidene lactic acid; syrup, which decomposes when heated; produced, by a bacterial fermentation, from dextrose, milk sugar and cane sugar; used in pharmacy for making fruit syrups and in dyeing; present in sour milk, sourkraut, pickles, and gastric juice. See SARCOLACTIC ACID.

**Lactic Anhydride.** $C_6H_{10}O_5$. Amorphous, insoluble powder, formed by heating lactic acid to 130° C.

**Lactide.** $C_6H_8O_4$. Mpt. 124.5° C.; Bpt. 255° C. Product obtained by attempting to distill lactic acid; white solid, very slightly soluble in water.

**Lactiferous Tissue.** System of latex-cells or latex-tubes in plants yielding a milky juice.

**Lactin.** Same as LACTOSE (q.v.).

**Lactometer.** See HYDROMETERS.

**Lactose.** $C_{12}H_{22}O_{11}+H_2O$. Sugar of milk, or milk sugar,

found in the milk of all mammals; obtained as a by-product in the manufacture of cheese; prepared for the market by crystallizing it on splinters or string; rhombic tablets, which begin to melt at 87° C.; used in the preparation of infants' foods.

**Lactoses.** Anhydrides derived by the abstraction of water from certain hydroxyacids.

**Lactucarium.** Inspissated juice of lettuce, *Lactuca virosa*, resembling opium in odor and appearance; is a mild narcotic.

**Lacunæ.** Intercellular air-spaces in vegetable tissues, about the size of the surrounding cells.

**Lacunar.** Panel or recessed part of a coffered ceiling; also applied to the whole ceiling.

**Lacunette,** or CUNETTE. See CUNETTE.

**Lacustrine.** Plants growing naturally in lakes or along their borders.

**Ladd,** GEORGE TRUMBULL, D.D., b. 1842. Prof. of Philosophy at Bowdoin Coll. 1879-81, and at Yale since 1881. *Psychology*, 1887–'91–'94.

**Ladder,** SCALING. Strong but light ladder, with rope or wooden rungs, used for scaling scarp walls from the ditches of old masonry forts; made in lengths of ab. 12 ft., to be easily and rapidly carried forward by the assaulting party, and capable of being joined together so as to reach above the point of escalade; now practically obsolete.

**Ladies' Peace.** Peace of CAMBRAY (q.v.), so called, because the negotiations were conducted by the mother of Francis I. and the aunt of Charles V.

Ladies' Tresses.

**Ladies' Tresses.** Orchids of the genus *Gyrostachys*, bearing white flowers in a terminal, twisted spike; natives of the n. hemisphere.

**Ladislas,** ab. 1375–1414. King of Naples 1387; constantly at war with a rival claimant and with the Pope. He took Rome 1408 and 1413.—Seven kings of Hungary bore this name, 1077–1516, and four of Poland, 1319–1648.

**Ladoga.** Lake of n.w. Russia, connected with the Gulf of Finland by the Neva. Area 6,804 sq. m.; average depth ab. 300 ft.

**Ladrones,** or MARIANA ISLANDS. In the Pacific, lat. 13° to 21° N., long. 144°–146° E.; discovered 1521; held by Spain. 4 of the 15 are inhabited. Area 417 sq. m.; pop. ab. 9,000.

**Ladybird Beetles.** Several species of round, dome-backed, bright-colored, spotted or striped beetles, less than ¼ in. long. Their larvæ destroy plant-lice.

Ladybird (*Coccinella ocellata*) magnified.

**Lady Day.** See ANNUNCIATION, FEAST OF THE.

**Lady Franklin Bay.** Deep inlet on the e. coast of Grinnell Land, between 81°–82° N. lat.

**Lady-in-the-Chair.** See CASSIOPEIA.

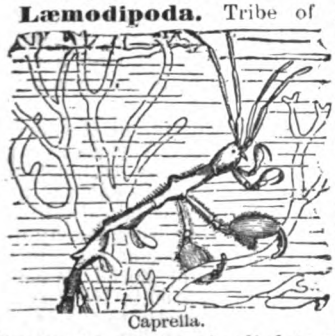
**Lady's Mantle.** Herbs of the genus *Alchemilla*, natural family *Rosaceæ*, of wide geographical distribution.

**Lady's Slipper.** Orchids of the genus *Cypripedium*, natives of the n. hemisphere; also garden Balsam, *Impatiens*.

**Lady's Thumb.** *Polygonum persicaria*. Weed of the Buckwheat family, native of Europe, commonly introduced into N. America.

**Lælaps.** See DINOSAURIA.

**Læmodipoda.** Tribe of Amphipods with lengthened thoracic segments, bearing legs in the region of the neck, and with a rudimentary abdomen whose segments have no feet. *Caprella* is an example.



Caprella.

**Laennec,** RENÉ THEODORE HYACINTHE, 1781–1826. French physician, inventor of the Stethoscope, ab. 1817. *Auscultation Médiate*, 1819.

**Læotropous.** Turning to the left, or opposite in direction to the movement of the hands of a watch. Applied to shells with left-handed spirals.

**Laertes.** One of the Argonauts; father of Ulysses.

**Læstrygones.** Mythical tribe of robbers and man-eaters, mentioned in the Odyssey, book x.; supposed to have inhabited Sicily or central Italy.

**Laet,** JAN, ab. 1595–1649. Geographer of Antwerp. His book on the West Indies, 1626–30, has been highly valued.

**Lætare Sunday.** 4th in Lent, when the Pope blesses the Golden Rose.

**Lævius,** 1st century B.C. Roman poet, known only by fragments.

**Lævo Compounds.** See DEXTRO-COMPOUNDS.

**Lævogyrate.** Elliptical or circular polarization, in which, if the beam be supposed viewed from behind, the ether particles describe their orbits in a clockwise direction.

**Lævorotatory.** Certain doubly-refracting crystals, such as some specimens of quartz, which are capable of rotating to the right, viewed from behind, the plane of polarization of a beam of plane polarized radiation.

**Lævo Tartaric Acid.** See TARTARIC ACID.

**Lævulose.** $C_6H_{12}O_6$. Sugar occurring in many fruits; formed, with dextrose, by the action of dilute acids upon cane sugar; very soluble in water; its solution in water rotates the plane of polarization of light to the left. It has about the same sweetening power as cane sugar. See DEXTROSE.

**La Farge,** JOHN, b. 1835. N.A. 1869. American painter, decorator, and artist in stained glass. As a painter he is strongest in religious subjects. He has frescoes in St. Thomas and Ch. of the Ascension, New York, and has exhibited numerous sketches from Japan and the South Sea Islands. His finest talent has been shown in designs for wood-cuts in book illustration; *e.g.*, Browning's Poems.

**La Farina,** GIUSEPPE, 1815–1863. Sicilian patriot and historian.

**Lafayette.** Capital of Tippecanoe co., Ind., on the Wabash; seat of Purdue Univ. Pop., 1890, 16,243.

**La Fayette,** MARIE MADELEINE PIOCHE DE LA VERGNE, COMPTESSE DE, 1634–1693. French novelist. Her *Zaide*, 1670, and *Princess of Clèves*, 1678, were in the modern style.

**Lafayette,** MARIE JEAN PAUL ROCH YVES GILBERT MOTIER, MARQUIS DE, 1757–1834. French republican, who served as Major-gen. in the American army 1777–82, and gave valuable aid both in the field and in creating sympathy at home for the cause. Returning to France, he identified himself with the

Marquis de Lafayette.

struggle toward constitutional liberty, and presented the Declaration of Rights, modeled on the Dec. of Independence. He was imprisoned in Austria 1792–97, revisited the U. S. 1824–25, and in the revolution of 1830 had command of the National Guard. He was a pure and high-minded patriot, and the most efficient foreign friend of American independence.

**Lafayette College.** Opened 1832 at Easton, Pa., under Presbyterian patronage. It gives 7 courses, including 3 of engineering, and (1895) has 18 professors, 19 instructors, ab. 309 students, and several good buildings in a park overlooking the Delaware and Lehigh rivers.

**Laffite,** JACQUES, 1767–1844. Parisian banker; Deputy 1817; promoter of the revolution of 1830; pres. of the Chamber 1843.

**Lafitau,** JOSEPH FRANCOIS, 1670–1746. French Jesuit, missionary in Canada 1712–17; writer on the Indians 1724, and on Portuguese Discoveries and Conquests 1733.

**Lafite,** JEAN, b. ab. 1780. French-American pirate, infesting the lower Mississippi from ab. 1810; pardoned 1815 for services at the battle of New Orleans. His later career is uncertain.

**La Fontaine,** JEAN DE, 1621–1695. French poet, noted for his *Fables*, 1668–94; Academician 1694.

**Lafuente,** MODESTO, 1806–1866. Spanish historian and essayist.

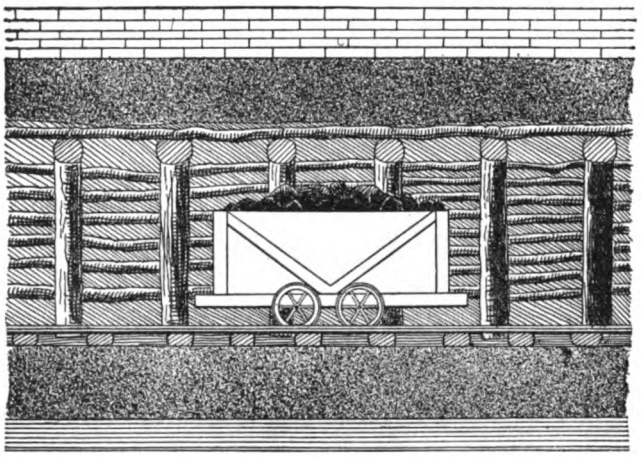
**Lagarde,** PAUL ANTON DE, 1827–1891. German biblical critic, prof. Gottingen 1869.

**Lagena.** Cochlear part of bird's ear; not spirally wound, as in mammals.

**Lagenidea.** Order of perforate *Foraminifera*, with calcareous, finely perforated shells, consisting of one or several chambers variously united (straight, curved, spiral, alternate, branched, etc.). There is a simple aperture to the terminal chamber, and no skeleton or system of canals in the outer walls.

**Lageniform.** In Botany and Zoölogy, bottle-shaped organs or organisms.

**Lagging.** Covering of strips of boards or planks, placed upon the main ribs of an arch centering.—Small pieces of timber driven behind the main sets of supports in a mine level, to prevent the fall of loose pieces of rock.



Lagging.

**Lagophthalmus.** Condition in which the eyelids cannot be brought together.

**Lagos.** Seaport of s. Portugal. In its bay a British defeated a French fleet Aug. 18, 1759. Pop. ab. 8,000.

**Lagos.** Town of w. Africa, on an island off the Guinea coast, with the only harbor in that region; capital of British colony formed 1886 from regions acquired 1851 and later. Pop. ab. 90,000.

**Lagrange,** JOSEPH LOUIS, F.R.S., 1736–1813. Mathematician, greatest of his age after Laplace; of French descent, b. in Turin; director Berlin Academy 1766; in Paris from 1787; Senator and Count ab. 1805. He solved at 19 the isoperimetrical problem, which had been long discussed in vain. Completed the Calculus of Variations 1762, and later proved the periodicity of changes in planetary orbits and the consequent stability of the solar system. His chief book is *Mécanique Analytique*, 1788. His works were repub. in 13 vols. 1869–89.

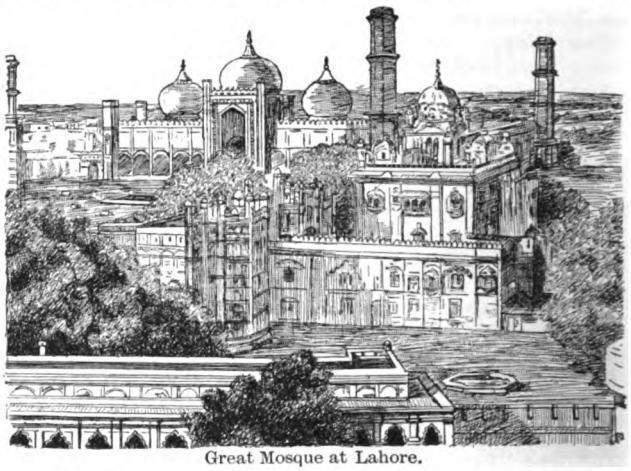
**La Guaira.** Port of Caracas, Venezuela; founded 1588; ruined by an earthquake 1812. Its harbor was improved by a large breakwater 1891; its commerce is important. Pop. ab. 15,000.

**La Guéronnière,** LOUIS ETIENNE ARTHUR DEBREUIL HELION, VICOMTE DE, 1816–1875. French journalist and pamphleteer; Minister of State 1853; Senator 1861.

**La Harpe,** JEAN FRANCOIS DE, 1739–1803. French dramatist and critic, Academician 1776.

**La Hogue.** Cape of n.w. France. Here the English and Dutch fleets, under Russell and Rooke, defeated the French fleet under Tourville, May 19, 1692, destroying 21 of their ships. This victory postponed indefinitely the French invasion of England.

**Lahore.** Capital of the Punjab, in British India, near the left bank of the river Ravee; founded probably ab. 700. As the seat of the Mogul emperors it was populous and wealthy. It has some fine ruins, and several modern colleges. Pop. ab. 177,000.



Great Mosque at Lahore.

**Laibach,** or LAYBACH. Capital of Carniola, 92 m. n. e. of Trieste. Here a congress met, Jan. 1821, to act upon Italian affairs. Pop., 1890, 30,505.

**Laidlaw,** JOHN, D.D., b. 1832. Prof. New Coll., Edinburgh, 1881. *Doctrine of Man*, 1879; *Miracles*, 1889.

**Laidlaw,** WILLIAM, 1780–1845. Factor and assistant of Sir W. Scott, often mentioned in his *Life*.

**Lainez,** IAGO, 1512–1565. Spanish Jesuit, second general of the Order 1557. He gave it its determinate imprint and policy.

**Laing,** ALEXANDER GORDON, 1794–1826. Scottish explorer of the Upper Niger.

**Laing,** DAVID, LL.D., 1790–1878. Scottish antiquarian; ed. Knox 1846–64.

**Laing,** MALCOLM, 1762–1818. Historian of Scotland (1688–1702), 1800.

**Lairesse,** GERARD, 1640–1711. Dutch painter. *Art of Painting*, tr. 1738.

**Laissez Faire.** Maxim attributed to Gournay as indicating the best that government could do for industry; motto for a policy of non-intervention in economic matters.

**Laitance.** Milky liquid which exudes from mortar and concrete when deposited under water.

**Lajard,** JEAN BAPTISTE FÉLIX, 1783–1858. French diplomatist, writer on archæology. *Mystères de Mithra*, 1847.

**Lake.** Combination of an organic coloring with a metallic oxide, forming a colored substance which is insoluble in water; *e.g.*, carmine lake is the combination of carminic acid and alumina.

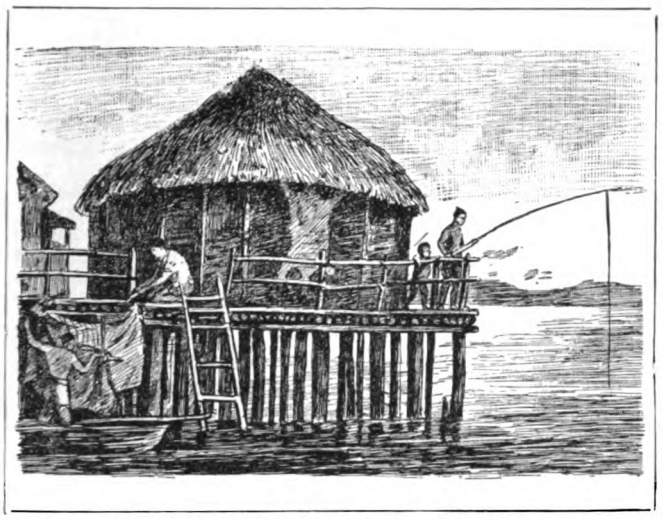
**Lake.** Inland body of water, generally without ingress from the sea. It is composed of fresh water if it has egress to the sea, salt if the only outlet is evaporation, or if the sea has ingress. Lake basins are ephemeral in a geologic sense, and are found only in a region in which erosion has made comparatively little progress. They may be produced by uplift, or by deposition from glaciers.

**Lake,** GERARD, VISCOUNT, 1744–1808. English general, commanding in Ireland 1797–98, and in India 1800–7; victor at Wexford and Killala 1798, at Delhi, Agra, and Lascuari 1803, and at Bhartpur 1805, overthrowing the last Moguls; Baron 1804, Viscount 1807.

**Lake District.** In Cumberland and Westmoreland. Its beauties were constantly celebrated by Wordsworth, especially in *The Excursion*. Southey also lived there, and for a time Coleridge, whence the term "Lake School of poets" was once much used.

**Lake-Dwellers.** The habit of constructing platforms for habitations in lakes has been found among various savage peoples of our own day, as in Africa, the Malay Archipelago, and Brazil. In Ireland and Scotland it continued down to historic times. See CRANNOG. The most famous lake-dwellings are those of prehistoric Switzerland. These were utterly unknown until 1854, when an unusual subsidence of the lake of Zurich led to the discovery. The Museum of Zurich is especially rich in remains of this culture; its representative student is Ferdinand Keller. The culture belongs partly to the STONE AGE and partly to the BRONZE and IRON AGES (q.v.); the transi-

tion from the earlier to the later culture, as represented by the abandonment of stone implements for bronze, has been most successfully studied here. The change was due to influences



Restoration of one of the Habitations of the Swiss Lake-Dwellers.

spreading from Italy. The dates for the highest antiquity of the Swiss lake-dwellings are not fixed, but they were in use 2000 B.C.

**Lake Erie,** BATTLE OF. Sept. 10, 1813. Commodore Perry with 8 small ships, carrying 14 guns, won a decisive victory over the British fleet of 6 ships with 70 guns, and announced it in the famous dispatch, "We have met the enemy, and they are ours."

**Lake Forest University.** At Lake Forest, Ill., a suburb of Chicago; chartered 1857; opened 1858, under Presbyterian patronage, with three undergraduate schools. With these were connected, 1887–89, colleges of law, medicine, and dental surgery, all in Chicago, and all, 1896, aggregating ab. 169 instructors and 2,192 students. The library has 13,000 vols.

**Lake George,** BATTLE AT. Aug. 26, 1755. William Johnson with 2,000 men defeated Dieskau with 1,500 French.

**Lake of the Woods.** On the n. boundary of Minn. It drains n. into Lake Winnipeg. Elevation 978 ft., area 612 sq. m.

**Lake Poets.** See LAKE DISTRICT.

**Lake Regillus.** See REGILLUS, LAKE.

**Lake Survey.** Bureau of U. S. army which had charge of the survey of the Great Lakes 1841–81. A precise triangulation was made, and numerous topographic and hydrographic charts were issued. The total cost was ab. $3,000,000.

**Lakewood.** In the pines of Ocean co., N. J., 44 m. s. by w. of New York; thus named 1880, and since highly developed as a winter resort; from 1866 called Bergen Iron Works.

**Lakshmi.** Hindu goddess of beauty and fertility; wife of Vishnu; corresponding to Venus.

**Lalande,** JOSEPH JÉRÔME LE FRANÇAIS DE, 1732–1807. Prof. of Astronomy in Coll. de France from 1762; author of several important works. *Traité d'Astronomie*, 1764.

**Lalita-Vistara.** Buddhist work on religious law; one of the nine chief works, known only in Sanskrit version; age and origin unknown.

**Lallemand,** CHARLES FRANÇOIS ANTOINE, 1774–1839. French general, Baron 1811; in exile 1815–30, and long in the U. S.

**L'Allemand,** PAULINE, b. ab. 1862. American singer.

**Lally-Tollendal,** THOMAS ARTHUR, BARON DE, 1702–1766. French general of Irish parentage; defeated and taken by the British in India 1761; executed on a false charge of treason. The sentence was reversed 1778 at Voltaire's urgency.—His son, TROPHIMUS GERARD, 1751–1830, pub. a Life of Strafford, and was made Marquis 1816.

**Lalo,** EDOUARD VICTOR ANTOINE, 1823–1892. French composer and violinist. His masterpiece is the opera *Le roi d'Ys*, performed 1888. A ballet, *Namouna*, became popular in orchestral concerts, and a pantomime, *Néron*, was produced 1891. Of his other compositions the most vital are three violin concertos, and the *Rhapsodie norvégienne* for orchestra.

**Lamaism.** Form of Buddhism, existing in Thibet and e. Mongolia; founded ab. 1370 by Thsong-Kappa, a Thibetan priest. Its seat is at Lhassa. Its head, the Dalaï-Lama, is regarded as a perpetual incarnation of Çakya-Muni, and is called the Living Buddha.

Lama of the Dalai Sect.

**Lamansky,** VLADIMIR, b. 1833. Prof. St. Petersburg 1865. *Græco-Slav World*, 1871.

**Lamar,** JOSÉ, 1778–1830. Pres. of Peru 1827–29; exiled 1829.

**Lamar,** LUCIUS QUINTUS CINCINNATUS, 1797–1834. Compiler laws of Ga., 1821; Judge Ga. Superior Court 1830.—His son and namesake, LL.D., 1825–1893, was M.C. from Miss. 1857–61 and 1873–77; U. S. Senator 1877–85; Sec. of the Interior 1885–88; Justice U. S. Supreme Court 1888.—His uncle, MIRABEAU BUONAPARTE, 1798–1859, was Pres. of Texas 1838–41, and U. S. Minister to Argentina 1857.

**Lamarck,** JEAN, 1744–1829. Lecturer at Paris 1794–1818 on the Invertebrates, a term which he introduced. He founded the groups, *Crustacea*, *Arachnids*, and *Annelides*. His later years were passed in blindness and over-confident speculation. He believed electricity competent to evolve living cells from inorganic matter. See TAXONOMY. Besides his great works, *Philosophie Zoölogique*, 1809, and *Hist. des Animaux sans Vertèbres*, 7 vols., 1815–22, he pub. *Flore Française*, 1778, *Hist. des Vegetaux*, 1802, and others on botany.

**Lamarckianism.** Doctrine of the transmutation of species according to laws formulated by Lamarck; *i.e.*: 1. Living things grow up to a limit which is self-regulated. 2. Adaptation is secured through longings or wants felt by the animal, which give rise to movements tending to satisfy the wants, and through these actions the existing parts are modified into more efficient organs. 3. Organs develop or degenerate, according to use or disuse. 4. Everything acquired by an animal is hereditarily transmitted to its offspring, provided both parents have the characters thus acquired. 2 and 4 are not accepted by the followers of Darwin.

**La Marmora,** ALFONSO FERRERO, MARCHESE DE, 1804–1878, Piedmontese general, prominent in the Crimea 1855 and in events leading to the unification of Italy; Minister of War from 1849; Prime Minister 1864–66; defeated at Custozza 1866.—His brother, COUNT ALBERT, 1789–1863, being in exile in Sardinia 1822–31, described the island in *Viaggio*, 3 vols., 1826–57, and *Itinerario*, 1860.

**Lamarque,** MAXIMILIEN, COMTE, 1770–1832. French general and writer. *Souvenirs*, 1835.

**Lamartine,** ALPHONSE MARIE LOUIS DE, 1790–1869. French poet and historian, Foreign Minister of the Republic 1848. All his work is colored by sentimentalism, but his poems were long popular, and his histories of *The Girondins*, 1847, and *The Restoration*, 1851–53, are still read.

**Lamb,** CHARLES, 1775–1834. English humorist, employed in E. India Co.'s London offices 1792–1825. His plays, *John Woodvil*, 1801, and *Mr. H——*, 1806, are less regarded than his *Tales from Shakespeare*, 1807, and *Specimens of Dramatic Poets*, 1808. His reputation rests chiefly on the *Essays of Elia*, 1823–33.—His sister, MARY ANN, 1765–1847, wrote some of the *Tales*.

**Lamb,** MRS. MARTHA JOANNA (NASH), 1829–1893. American writer. *History of New York City*, 1877–81.

**Lamb,** WILLIAM. See MELBOURNE.

**Lamballe,** MARIE THÉRÈSE LOUISE DE SAVOY-CARIGNAN, PRINCESSE DE, 1749–1792. Superintendent of the French royal household. She returned from England to be with Marie Antoinette in her extremity, and was murdered by the Parisian mob.

**Lambert,** DANIEL, 1769–1809. Englishman noted for his corpulency, weighing 739 lbs.

**Lambert,** JOHANN HEINRICH, 1728–1777. Ed. Prussian Astronomical Almanac; member Berlin Academy 1764. He introduced hyperbolic trigonometric functions, and expressed the physical law called "vis viva" in terms of the differential Calculus. *Photometria*, 1760; *Kosmologische Briefe*, 1731. *Works*, 4 vols., 1765–72.

**Lambert,** JOHN, 1619–1694. English republican, prominent in the civil war; Major-gen. 1647; exiled 1662 for violent opposition to the restoration of Charles II.

**Lambeth,** TREATY OF. Between the Earl of Pembroke, regent, and the French prince, Louis, Sept. 11, 1217. Louis was to leave England, and a general amnesty to be granted.

**Lambeth Articles.** Prepared 1595 by Abp. Whitgift and scholars from Cambridge; too Calvinistic for the queen, and never binding on the Ch. of England.

**Lambeth Palace.** In s. London; occupied by Abp. of Canterbury since 1197. The "Lollards' Tower" was built ab. 1434. The library is noted for its collection of rare books, including what was called the most valuable Koran of Asia when presented in 1805. The roof of the library is of finely-carved oak.

Lambeth Palace.

**Lambin,** DENIS, 1520–1572. Swiss-French student, prof. Paris 1561; ed. Cicero and other Latin authors.

**Lambinet,** EMILE, 1815–1878. French painter.

**Lambkill.** *Kalmia augustifolia.* Low shrub of the Heath family, native of e. N. America; called Sheep Laurel.

**Lamb Lettuce.** See CORN SALAD.

**Lambruschini,** RAFFAELLO, 1788–1873. Italian writer on education.

**Lamb's Quarters.** *Chenopodium album.* Coarse weed of the Goosefoot family, native of the Old World, naturalized in America; also *Atriplex patula*, a plant of the same family.

**Lamb's Wool.** English beverage of roasted apples and ale, highly spiced.

**Lamé,** GABRIEL, 1795–1870. French mathematician and physicist. Prof. Polytechnic in Paris 1832; discoverer of Lamé's Functions.

**Lamella.** In Mycology, one of the flat radiating gills on the under side of the pileus in mushrooms and toadstools.

**Lamellibranchiata,** ACEPHALA, PELECYPODA, LIPOCEPHALA, or CONCHIFERA. Class of *Mollusca*, including forms having no distinct head, the body laterally compressed, and with a right and a left valve to the shell. The valves are united by a special dorsal (hinge) ligament. They have one or two pairs of gill plates, and a bilobed mantle. Usually the animals are diœcious. The families are grouped in two divisions, ASIPHONIA and SIPHONIATA (q.v.). All Lamellibranchs live on microscopically small food, which is suspended in the water that is drawn in ventrally, strained through the gills and expelled dorsally and posteriorly. The food caught on the gills is wafted by cilia toward the mouth; cilia line the stomach and intestines, wafting it onward until digested.

**Lamellicornia.** *Coleoptera*, with pentamerous tarsus and seven to eleven jointed antennæ, the outer joints of which are widened to a fan shape. The larvæ are soft skinned, with horny head and curved abdomen; they lie in the ground as grubs, feeding on the roots of plants, or on decaying vegetable substances, for two, three or more years, before the pupa stage is attained.

**Lamellirostres** (CHENOMORPHÆ, AMPHIMORPHÆ). Family of *Natatores*, having a broad beak, covered with soft, sensitive skin, with tooth-like lamellæ on its edges and a nail-like point. The feet are palmate, with rudimentary free hind toe. Here belong the Flamingoes (*Phœnicopterus*), Ducks (*Anas*), Geese (*Anser*), and Swans (*Cygnus*). These are classed into two great groups, the *Anseres* (or Anserines) and the *Odontoglossa* (or *Amphimorphæ* restricted), including the *Phœnicopteridæ*.

**Lamennais,** HUGUES FÉLICITÉ ROBERT DE, 1782–1854. French priest, at first Ultramontane, afterward wholly estranged from the Church. His *Indifference in Religion*, 1818–24, was conservative; his *Words of a Believer*, 1834, an epoch-making prose poem, still thrilling in its passionate democracy, in effect bade defiance to all authority, and was condemned by the Pope. A noble but restless and unhappy enthusiast, he was buried by his own order in a nameless grave. *Sketch of a Philosophy*, 4 vols., 1840–46.

**Lamentations.** 25th O. T. book, an elegy over the desolations of Judah after being carried captive to Babylon by Nebuchadnezzar, 588 B.C.; commonly ascribed to Jeremiah.

**Lameth,** CHARLES MALO FRANÇOIS, COMPTE DE, 1757–1832. French general, Deputy 1789 and 1829.—Like his brothers, THEODORE, 1756–1854, and ALEXANDRE VICTOR, 1760–1829, he bore a spirited part in the early events of the Revolution, and narrowly escaped its fury. All were moderate republicans; the youngest was an author.

**Lamettrie,** JULIEN OFFRAY DE, 1709–1751. French army-surgeon, first exponent of the materialism adopted by D'Holbach and Cabanis; driven from France for his *Histoire Naturelle de l'Ame*, 1745, and from Holland for *Homme Machine*, 1748. In Berlin, where Frederic II. protected him, he handled the authorities of medicine with no less irreverence.

**Lamia.** 1. In Greek legend, African monster, part woman and part serpent, who enticed and devoured children; said to have been a queen bewitched by Hera. 2. Mistress of Demetrius Poliorcetes, for whose benefit he taxed Athens.

**Lamian War.** Resistance to Macedonian rule, after Alexander's death, by Athens, Ætolia, and their allies. Antipater was defeated at Heraclea 323 B.C., and besieged in Lamia, a town of Thessaly. After the battle of Crannon, 322, the Greeks submitted: Athens was severely punished.

**Lamina.** Blade of a leaf, or expanded thallus of an alga; also blade of a petal.

**Laminariaceæ.** Order of large brown or dark-green marine *Algæ*, sometimes known as Devil's-aprons.

**Laminarian Zone.** See BATHYMETRIC DISTRIBUTION.

**Laminiplantar.** Form of metatarsus or leg of birds, which has a horny sheath on the front and sides as in singing birds.

**Lammas Day.** Aug. 1, feast of St. Peter ad Vincula, when the first fruits of harvest were offered of old.

**Lämmergeyer** (GYPAETUS BARBATUS). Bearded vulture of the Old World mountain peaks. Its length is 4 ft., wing expanse 9 ft., weight 20 lbs. The general color is blackish brown, with the shafts of the feathers white, the neck and under parts yellowish, the crown of head white, the beard black; the iris is orange encircled by red sclerotic. The young are darker, and are called black vultures. Accounts of its attacking human beings are exaggerations. It is known to drop bones and turtles from a great height to break them, to secure the marrow, etc., for food. It lays one dull yellow egg. It is nearly exterminated in the Alps, but more abundant in the Pyrenees.

**Lamnungia.** See HYRACOIDEA.

**Lamont,** DANIEL SCOTT, b. 1851. Sec. to Pres. Cleveland 1885–89; U. S. Sec. of War 1892.

**Lamoricière,** CHRISTOPHE LOUIS LEON DE, 1806–1865. French general, who made 15 campaigns in Algiers, and ended the war by capturing Abd-el-Kader 1847; Minister of War 1848; exiled 1851–57.

**La Motte,** ANTOINE HOUDARD DE, 1672–1731. French dramatist, poet, and essayist, Academician 1710.

**Lampas.** Inflammation and swelling of the bars in a horse's mouth so that they cover, or nearly so, the front teeth, making eating impossible or difficult.

**Lamp Black.** Finely divided carbon, obtained by burning oils which consist largely of carbon and hydrogen, and allowing the flame to strike some cold surface; used in the manufacture of printer's ink.

**Lampreys** (PETROMYZONTIDÆ). Family of cyclostome fishes, with seven external gill openings on each side of the neck, and a common internal passage opening into the pharynx. The nasal sac does not open into the mouth. The mouth is circular, with fleshy toothed lips, with which it adheres to objects by suction. The Sea Lamprey (*Petromyzon marinus*) grows to two feet in length: it ascends rivers with the shad in spring, to spawn. *P. planeri*, one of the River Lampreys, has *Ammocœtes* as its larva, which differs from the adult in being without eyes or teeth, and in the form of its lips. The popular belief that lampreys are related to eels is erroneous.

**Lampridius,** ÆLIUS, 3d cent. Latin author of four biographies in Augustan History, Commodus to Alexander Severus.

**Lamps.** Early used by the Egyptians and Greeks; for general domestic purposes, known in Greece by 400 B.C. Skulls and sea-shells preceded the terra-cotta bowl of oil, which contained a wick supported by a floating disk or resting in a groove on its edge. The Erechtheum (Athens) had a gold lamp which, with one filling, burned continuously for a year. There is scarcely a fixed or fatty oil but has been used for light-

Pottery and Bronze Lamps from Pompeii and Herculaneum.

ing purposes, but nearly all have been superseded by refined petroleum, gas, and electricity. Modern invention has found methods to increase the brightness and strength of light, and to prevent smoking, chiefly by producing a steady current of air (see ARGAND LAMP). The Moderator lamp regulates the feeding of the oil by means of a piston controlled by a spring, the Carcel lamp, invented in 1803, by means of a clock-work pump.

**Lampyridæ** (MALACODERMATA). Family of *Coleoptera*, including the Fire-flies. The three regions of the body in these forms are not well separated; the body is elongated and has phosphorescent glands on the last abdominal segment. The larva lives in the ground and feeds on earthworms.

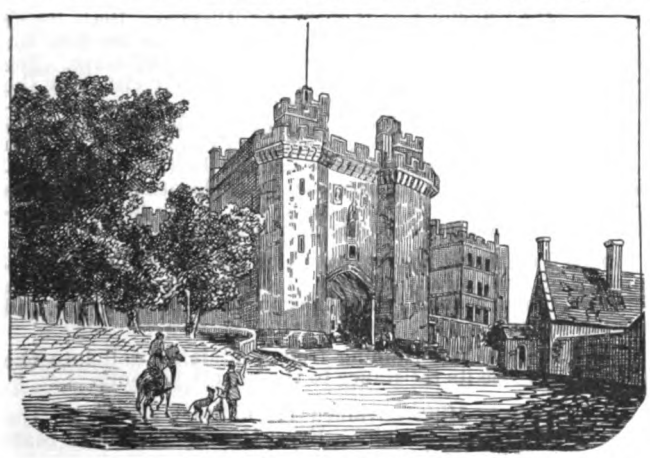
**Lanate,** LANOSE, or LANUGINOUS. Leaves or other organs when covered with long, woolly hairs.

**Lancashire Boiler.** See BOILER, STEAM.

**Lancaster.** Capital of Lancaster co., Pa., on Conestoga Creek; founded 1730. It has manufactures chiefly of cotton and tobacco, and was the capital of Pa. 1799–1812. Here are Franklin and Marshall Coll. and a (German) Reformed theol. sem., founded 1824, with ab. 40 students. Pop., 1890, 32,011.

**Lancaster,** DUCHY OF. Created 1351; vested in John of Gaunt and his heirs 1362. It reverted to the crown 1461: its revenues belong to the sovereign's private purse.

**Lancaster,** HOUSE OF. Derived from John of Gaunt, 4th son of Edward III., created Duke of Lancaster 1362. From him in direct line descended the Henries IV., V., and VI.; and from Katherine of France, queen of Henry V., through Ed-



Lancaster Castle.

mund Tudor, Earl of Richmond, who married Margaret Beaufort, also a lineal descendant of John of Gaunt. Henry VII. also, who married Elizabeth, eldest daughter of Edward IV., and so ended the feud between the Houses of Lancaster and York. Its badge was a red rose.

**Lancaster,** SIR JAMES, d. 1618. English seaman, knighted 1603, after exploits in S. America and the Indies; director of the East India Co.

**Lancaster,** JOSEPH, 1778–1838. English educator, in the U. S. from 1818; introducer of a system of education claimed also by Dr. Andrew Bell.

**Lancaster Gun.** Smooth-bore, muzzle-loading gun, having a bore of oval cross-section and increasing twist; devised for English service by Lancaster ab. 1850. The projectile was an elongated one, having nearly the same oval cross-section, so as to allow for windage. When inserted in the muzzle and rammed to its seat, it was obliged to make a quarter of a turn. On being fired, rifled motion was thus imparted to the projectile. The failure, by jamming the projectile in the bore, of some converted 8-inch and 68-pound cast-iron guns, during the Crimean War, led to the abandonment of the system.

**Lancaster Sound.** Channel in Arctic regions 250 m. long leading w. from Baffin's Bay to Barrow Strait.

**Lance.** Thrusting weapon for mounted troops, consisting of a long shaft with a metal head; length 8½ to 11 ft., weight 4 to 5 lbs. The modern German lance is a hollow steel tube with a four-edged point of forged steel forming one piece with the shaft. The shaft is crowned, and on it are six rings for the pennon, a ring for the sling, and a frapping of cord for the gripe. The lower part of the shoe is conical. Total length 10 ft. 4.4 in.; weight 4.36 lbs.; center of gravity 5 ft. 1.02 in. from the point.

**Lance,** GEORGE, 1802–1864. English fruit and flower painter.

**Lancelet.** See LEPTOCARDII.

**Lancelot** OF THE LAKE. Knight of the Round Table; model of chivalry, yet lover of Queen Guinevere; leading figure in the Arthurian legends and in Tennyson's *Idyls of the King.*

**Lanceolate.** Leaves or other organs several times longer than their width, and tapering gradually to one or both ends.

**Lancers.** Cavalry armed with lances in addition to saber and pistol. The lance was introduced in modern cavalry by Napoleon, who organized some regiments of Polish lancers. All European armies have now some lancers in their cavalry; the U. S. has none.

**Lancet.** Two-edged, pointed knife used for opening boils, etc.

**Lancet Window.** One whose head is shaped like the point of a lancet. They are found in English ecclesiastical architecture of the 13th century.

**Lancewood.** *Guatteria virgata.* Wood of a small tree of the West Indies, much used for making fishing-rods.

**Lanciani,** RUDOLFO AMEDEO, LL.D., b. 1847. Italian archæologist, universally recognized as an expert authority; director of excavations 1877; prof. Rome 1878; prolific writer. *Ancient Rome*, tr. 1888; *Pagan and Christian Rome*, tr. 1892.

**Lancret,** NICOLAS, 1690–1743. French genre painter, ranking with Pater and Fragonnard and below Watteau. The

The Hawk (La Fontaine's Fable), by Lancret.

pictures of Watteau and Lancret are often confounded from similarity of subject and treatment.

**Land,** IN ECONOMICS. Surface and upper strata of the earth, looked upon as capable of producing food and raw materials for all manufacture; also mines, quarries, water-power, and all other free gifts of nature which are limited in quantity.

**Landau.** Old town of Bavaria, fortified by Vauban 1688; taken by Louis of Baden 1702, by the Allies 1704, by the French 1703 and 1713. Its fortifications were destroyed 1871. Pop., 1890, 11,047.

**Land Bank.** Establishment which lends money on the security of real estate. It is usually a mutual organization, lending to its members only, and its certificates frequently circulate as currency. Such banks are in successful operation in France, Belgium, Germany, Austria, and Russia.

**Land Batteries.** Permanent defenses for harbors, seacoasts, and other strategical positions, as distinguished from floating or sea batteries. Granite masonry, which up to 1860 afforded sufficient protection to the armament, is now entirely replaced by armor, earthen parapets of great thickness, and other devices capable of resisting the great penetration of modern rifled artillery.

**Landen,** BATTLE OF. See NEENWINDEN.

**Lander,** RICHARD, 1804–1834. English explorer in Africa, with Clapperton 1825–27.—With his brother JOHN, 1807–1839, he traced the lower course of the Niger. *Journal*, 1832. A third expedition was fatal.

**Landes.** Sandy plains in s. w. France, partly covered with forests.

**Landes,** LOUISA, b. 1826. American sculptor, studied in Rome under Crawford. She has modeled busts of Hawthorne and Gov. Gore of Mass.

**Landing.** In military mining, horizontal floor of a gallery between the frames that bound the entrance to a return gallery.

**Land League.** The agricultural depression of 1877–79 in Ireland led to the organization, Oct. 21, 1879, of the Irish National Land League, to secure a reduction of rack-rents and to promote land-ownership by its cultivators. The League soon became powerful, but its members began to pass the line of legality. The Land Bill, 1881, bettered the condition of the tenant, but the League decided to maintain its attitude of resistance until they found its results were entirely satisfactory. The leaders, Parnell, Davitt, Dillon, and Sexton, were arrested, and in prison issued a proclamation ordering that no rents whatever should be paid. Then, Oct. 18, the League was declared unlawful, and so ceased to exist. Many of its objects have been accomplished through the Irish National League, organized a year later.

**Landlord and Tenant.** Owner and hirer of an estate in land. The landlord may sell and convey his estate, subject to the tenant's rights of possession; the tenant may sub-let, unless prohibited by his lease. The landlord is bound to secure to the tenant quiet enjoyment of the estate; the tenant is bound to pay rent, and to deliver the premises at the end of his term in as good condition as when he took them, subject to ordinary consequences of use, unless these obligations are modified by local statute or by agreement.

**Land Office.** Bureau of the U. S. Interior Department, which has charge of the survey and sale of the public lands, established 1812.

**Landois,** LEONARD CHRISTIAN CLEMENS AUGUST, b. 1837. Prof. Greifswald 1872; writer on physiology.

**Landolt,** EDMUND, b. 1846. Swiss oculist, in Paris since 1874. *Diseases of the Eyes*, 1877; *Ophthalmology*, 1886.

**Landon,** LETITIA ELIZABETH ("L. E. L."), 1802–1839. English poet and novelist. She became Mrs. G. Maclean 1838, and d. in Africa.

**Landor,** WALTER SAVAGE, 1775–1864. English poet and essayist, long resident in Italy. *Gebir*, 1798; *Imaginary Conversations*, 1824–29; *Pericles and Aspasia*, 1836; *Hellenics*, 1847. His eccentricity nearly approached madness; his works, though highly prized by a few, were never popular.

**Landouzy,** LOUIS, b. 1850. Prof. Paris 1880; writer on nervous diseases.

**Land Plaster.** See GYPSUM.

**Landrecy.** Town of n. e. France; on the Sambre; taken by Charles V. 1543; by Turenne 1655; by the Allies 1794, and by the Prussians 1815.

**Landscape Gardening.** The Romans introduced this art into Britain. Lost under the Saxons, it was probably brought back by the Normans. Through the Middle Ages stiff geometrical designs, without attempt to harmonize the separate features, were maintained. The more graceful modern results in England are due to William Kent, 1684–1748, and Lancelot Brown, 1715–83, of the 18th century. Humphrey Repton, 1752–1818, assumed the title of landscape gardener.

**Landseer,** SIR EDWIN HENRY, 1802–1873. English animal painter; R. A. 1831; knighted 1850. His works, long vastly popular, show to best advantage in the engravings by his brother THOMAS, 1796–1880, biographer of Bewick.—Their

Chevy Chase, by Sir Edwin Landseer.

brother, CHARLES, 1799–1879, was a historical painter.—Their father, JOHN, 1761–1852, was active and prominent as an engraver.

**Land's End.** Anciently Bolerium. Headland projecting on the Atlantic, at the w. extremity of Cornwall, Eng. It is formed of granite rocks 60 ft. high. Near by are the Longships with a lighthouse visible 16 m.

**Landslip.** Earthquakes, frost, and water frequently cause avalanches of earth down mountain-sides. The village of Roccabruna, near Nice, once slipped some distance without disturbing the houses. In 1826 a landslip in New Hampshire choked the Saco River and flooded the adjacent country. Two hundred lives were lost by one in Switzerland 1881. Others have occurred in Dorsetshire 1839, on the Himalayas 1880, and at Zug 1887.

**Land Spout.** Cloud burst, or cataract of water pouring from the clouds; water spout on the land.

**Landsturm.** Levy en masse in the event of an invasion of a country. All able-bodied men in Germany between 17 and 45, who are neither in the active army nor in the reserves, belong to it. It is divided into two classes or bans; the first comprising those between 17 and 39, the second those older.

**Land Surveying.** This originated in Egypt, where measurements were annually necessary to recover boundaries obliterated by the inundation of the Nile. The science of Geometry furnishes the principles of the art of surveying. Both linear and angular measures are required to determine the data for the computation of areas and the construction of maps. The former are made by chains and tapes; the latter either by the compass or by the transit. The rectangular method of computing areas was introduced by Rittenhouse ab. 1763. In many States county surveyors are appointed or elected, and all public roads and boundaries must be laid out by them. The precise methods of surveying necessary in the location of railroads have greatly influenced land surveyors to use better instruments and make more accurate measurements.

**Land Tenure.** System on which the ownership and occupancy of land in any country is organized; *e.g.*, tenure in common, feudal tenure, peasant proprietorship, métayage, and tenancy at will.

**Land Ties.** Ties running from a retaining wall into the earth to increase its resistance to the lateral pressure.

**Landwehr.** Militia trained for military service in the Austrian and German armies. Every German capable of bearing arms is liable for military service in the army or navy for six years (seven for cavalry and horse artillery), from his 20th year. Two years (three for cavalry and horse artillery), must be spent in active service, the remainder in the reserve. On the completion of this term, the soldier is placed in the first ban of the Landwehr for 5 years (4 for cavalry and horse artillery), and then for 7 years in the second ban. Owing to the legal limitations of the peace strength (ab. 500,000 men), not all who are available for military service are drafted into the

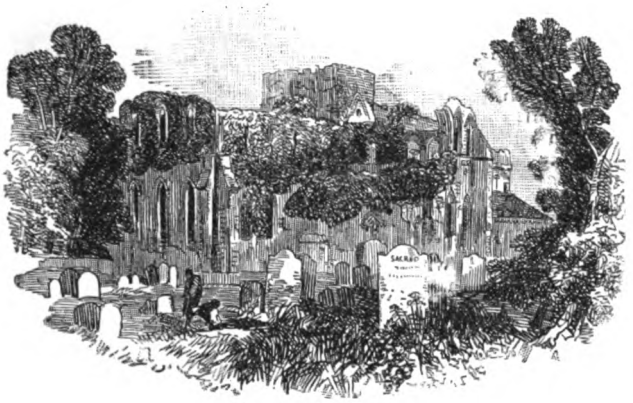
active army, and these form a sort of reserve called *Ersatztruppen*, whose term of service is 12 years, and who are liable for three periods of drill yearly, of 10, 6, and 4 weeks. After their 12 years of service the trained men also pass into the first ban of the Landwehr, and the untrained into the second ban. See ARMED STRENGTH OF EUROPEAN NATIONS.

**Lane,** EDWARD WILLIAM, Ph.D., 1801–1876. English orientalist, translator of the *Arabian Nights*, 1838–40. *Modern Egyptians*, 1836. His great *Arabic Lexicon*, 5 vols., 1863–74, was completed 1877–90 by his great-nephew, STANLEY LANE-POOLE, b. 1854, who wrote his *Life*, 1877, *Egypt*, 1883, *Turkey*, 1888, and other books.—His brother, RICHARD JAMES, 1800–1872, was an engraver and lithographer.

**Lane,** JAMES HENRY, 1814–1866. M.C. from Ind. 1853–55; leader of the Kansas free-soil party 1855–60; U. S. Senator from Kan. 1861.

**Lane,** JOSEPH, 1801–1881. Brig.-gen. in the war with Mexico; Gov. of Oregon 1848; M.C. 1851–57; U. S. Senator 1859–61; candidate for Vice-pres. 1860.

**Lanercost Priory.** In Cumberland, Eng. Founded 1169 for Augustine monks, and partly burned in 1296. It was the center of a 3 days' encampment of Robert Bruce in 1311.



Lanercost Priory.

These old buildings are now in most part vine-clad, roofless ruins, but the nave of the conventual church has become the parish church.

**Lane Theological Seminary.** At Cincinnati; founded 1828; Presbyterian. It has, 1896, 10 instructors and 38 students, and a library of 17,000 vols.

**Lanfranc,** ab. 1005–1089. Abbot of Caen 1062, Abp. of Canterbury 1070; a respectable prelate, useful to William I. in remodeling the English Ch. after the Norman conquest.

**Lanfranco,** GIOVANNI, 1581–1647. Italian painter.

**Lanfrey,** PIERRE, 1828–1877. French historian, Senator 1875. His chief work, *Napoleon I.*, 5 vols., 1867–74, is unfavorable to the emperor.

**Lang,** ANDREW, LL.D., b. 1844 in Scotland. Poet, essayist, and translator, noted for brilliancy and versatility. *Ballades*, 1880–88; *Custom and Myth*, 1884; *Letters to Dead Authors*, 1886; *Myth, Ritual, and Religion*, 1887; *Blue Fairy Book*, 1889; *St. Andrews*, 1893; *Homer*, 1894; *A Monk of Fife* (a novel), 1895.

**Lang,** CARL, b. 1849. Bavarian meteorologist.

**Langdale,** SIR MARMADUKE, ab. 1598–1661. Royalist commander at Naseby; engaged in many battles in England and Scotland.

**Langdon,** JOHN, 1741–1819. Revolutionary patriot, who expended his means and credit to equip Stark's brigade; Gov. of N. H. 1788, 1805–9, and 1810–12; U. S. Senator 1789–1801.

**Lange,** FRIEDRICH ALBERT, 1828–1875. German author. *History of Materialism*, 1866.

**Lange,** JOHANN PETER, D.D., 1802–1884. Prof. at Zurich 1841, Bonn 1854. *Life of Jesus*, 1844–47, tr. 1864; *Bibelwerk*, 1857–76, tr. 24 vols. 1864–74.

**Lange,** THOMAS, 1829–1887. Danish novelist.

**Lange,** THOR. Danish descriptive writer. *Sketches*, 1890.

**Langebek,** IAKOB, 1710–1775. Danish historical scholar and editor.

**Langeland.** Danish island s. e. of Funen; 33 m. long by 5 wide. Area 106 sq. m.; pop. ab. 20,000.

**Langenau,** CASTLE OF. Stands below the convent of Arnstein on the Lahn, Germany. The family from which it took

Langenau.

its name became extinct at the beginning of the 17th century. For a time it was fitted up as a hospital. Now it is used for agricultural purposes.

**Langenbeck,** BERNHARD RUDOLF CONRAD VON, 1810–1887. Prof. Kiel 1842 and Berlin 1848; Surgeon-general in the wars with Denmark, Austria, and France.

**Langendijk,** PIETER, 1683–1756. Dutch dramatist.

**Langensalza.** Town of Prussian Saxony, scene of battles, Feb. 15, 1761, April 17, 1813, and June 27, 1866. In the last, the Prussians were temporarily defeated by the Hanoverians.

**Langevin,** SIR HECTOR LOUIS, b. 1826. Canadian Minister of State, knighted 1881.—His brother, JEAN FRANÇOIS PIERRE LA FORCE, 1821–1892, became Bp. 1867. Both have written on Canada.

**Langham,** SIMON, ab. 1310–1376. Bp. of Ely 1362, Abp. of Canterbury 1366–68; opponent of Wiclif; Cardinal 1368, and thenceforth at Avignon.

**Langland,** WILLIAM, ab. 1332–ab. 1400. English poet. His *Vision of Piers Plowman*, modeled on the alliterative Anglo-Saxon poetry, appeared in three recensions, 1362, '77, '93. It is an allegory and a satire on the corruptions of the times.

**Langlès,** LOUIS MATHIEU, 1763–1824. Founder at Paris of the school of Eastern languages, and of the Geographical Society; writer on Oriental topics.

**Langley,** JOHN NEWPORT, F.R.S., b. 1852. English physiologist.

**Langley,** SAMUEL PIERPONT, b. 1834. Prof. of Mathematics U. S. Naval Academy 1865; director of the observatory at Allegheny City 1867; sec. Smithsonian Institution 1887; author of many valuable contributions to the knowledge of solar physics.

**Langlois,** VICTOR, 1829–1869. French traveler in the East. *Cilicie et Taurus; Mont Athos*, 1867.

**Langside.** Town near Glasgow, where the Earl of Murray, regent of Scotland, defeated Queen Mary's troops, May 13, 1568. Mary fled to England. Pop. 6,000.

**Langston,** JOHN MERCER, LL.D., b. 1829 in slavery. Prof. Howard Univ. 1869; U. S. Minister to Haiti 1877–85; Pres. Va. Normal Institute 1885. *Freedom and Citizenship*, 1883.

**Langtoft,** PETER. English monk, author, ab. 1300, of a rhymed French chronicle, a version of which was pub. 1725 and 1887.

**Langton,** STEPHEN, ab. 1150–1228. Cardinal 1206, Abp. of Canterbury 1207; main opponent of King John in behalf of liberty, and also, temporarily, of Pope Innocent III. His was the first signature to Magna Charta.

**Langtry,** MRS. EMELIE CHARLOTTE (LE BRETON), b. 1853. English actress.

**Language.** See PHILOLOGY.

**Languages,** CLASSIFICATION OF. Often an uncertain process. At the head stand Aryan and Semitic groups, inflected languages, with intricate development; then, of agglutinative tongues, the so-called Scythian, the Dravidian, along with Japanese, Corean, and others; then the Chinese and related

languages of the monosyllabic type; and finally a more or less unclassified mass, such as Malayan, Australian, the Hamitic and other African dialects, and the great American group. Basque, ancient Etruscan, and some others, may count as unclassified. Classification by form, or Morphology, partially given above, is based on order of development, and so on relative complexity of structure, or amount of differentiation. Max Müller distinguished three general classes: (1) Roots are themselves words, and language is a series of unconnected hints; (2) a root, losing independence, is joined to another root, forming a new word; (3) the compound may change both roots entirely.

**Languedoc.** Old province of France, corresponding nearly with Gallia Narbonensis, between the Garonne and the Rhone; named from the dialect (Langue d'oc). It escheated to French crown at the Albigensian crusade.

**Languet,** or DORSAL LAMINA. Fold in the branchial sac of Tunicates, opposite the endostyle.

**Laniary Tooth.** Canine tooth, fitted for tearing, as in carnivorous animals.

**Lanier,** SIDNEY, 1842–1881. American poet and critic, whose character was of the pure artistic type, and his life a manly struggle with disease. His poems, which are very highly valued by a somewhat limited class, were collected 1884. *Boy's Froissart*, 1878; *Science of English Verse*, 1880; *The English Novel*, 1883.

**Lanjuinais,** JEAN DENIS, 1753–1827. Prof. of Law at Rennes 1775–89; Deputy from 1789, narrowly escaping during the Terror; active in public affairs, always as a liberal, though ennobled on the restoration. *Constitution of the French Nation*, 1819; *Municipal Organization*, 1821. *Works*, 4 vols. 1832.

**Lankester,** EDWIN, M.D., LL.D., F.R.S., 1814–1874. Prof. New Coll., London, 1850; popularizer of science by books and lectures.—His son, EDWIN RAY, LL.D., F.R.S., b. 1847, prof. Univ. Coll., London, 1875, and Oxford, 1890, is an eminent zoölogist. *Degeneration*, 1880.

**Lanman,** CHARLES, 1819–1895. American author. *Dictionary of Congress*, 6 vols., 1858–69; *Japanese in America*, 1872; *Civil Govt. U. S.*, 1876.—His cousin, CHARLES ROCKWELL, Ph.D., b. 1850, prof. Harvard 1880, pub. *A Sanskrit Reader*, 1881.

**Lannes,** JEAN, DUKE OF MONTEBELLO, 1769–1809. French general, eminent for his daring; with Napoleon in Italy and Egypt; Marshal 1804. He led the van at the crossing of the

Battle of Montebello.

Alps, defeated the Austrians at Montebello, June 9, 1800, took Saragossa Feb. 21, 1809, and was mortally wounded at Essling, May 22.

**Lanoline.** Purified wool grease. Unscoured wool contains a considerable percentage of a grease which is a combination of fatty acids with cholesterin. This grease, removed and purified by distillation or otherwise, is used in pharmacy. It does not become rancid on standing. See DEGRAS.

**La Noue,** FRANÇOIS DE, 1531–1591. Huguenot soldier; defender of La Rochelle 1573–77; in the Dutch service 1577; prisoner in Spain 1580–85. *Discours politiques et militaires*, 1587.

**Lansdowne,** HENRY PETTY-FITZMAURICE, 3d MARQUIS OF, 1780–1863. M.P. 1802, Marquis 1809; liberal leader in the House of Lords, and member of six cabinets. He declined a dukedom, and twice the premiership.—His grandson, HENRY CHARLES KEITH, b. 1845, became 5th marquis 1866, sat in two cabinets, was Gov.-gen. of Canada 1883–88, and Viceroy of India 1888–93.

**Lansdowne Hill.** Near Bath; scene of a royalist victory over Waller, July 5, 1643.

**Lansing.** Capital of Michigan; in Ingham co., on Grand River; settled 1847, incorporated as a city 1859. The capitol, built 1871–78, cost $1,500,000. The State Agricultural College, Reform School, and School for the Blind, are in the vicinity. Pop., 1890, 13,102.

**Lansingburgh.** Town of Rensselaer co., N. Y., on the Hudson, 10 m. above Albany. Pop., 1890, 10,550.

**Lansquenet.** National card game of Germany, originally known as Landsknechtspiel; borrowed by the French; said to have been known in France 1392. The date of its invention is uncertain. It is a round game played with one or two full packs; the first two cards are turned upon the table, the third is the dealer's, and the fourth the rejouissance card, upon which the bets are made. The cards are then turned up successively, those not matching any turned card are placed beside the rejouissance card and may be bet upon. Should the first two cards mentioned above be matched before the dealer's, he takes another deal. The dealer wins on matches on all turned cards except his own, for which last he pays all bets on the table.

**Lantern.** In Architecture, a light and open turret over a tower or roof.

**Lantern Gear.** The teeth on one wheel of a pair are formed of round staves held in pitch and parallel to the shaft by two disks to which the staves are fastened. It is much used in horology, since a very small number of staves can be used (five if desired), so that a rapid reduction of velocity is possible with few wheels in the train. When the lantern pinion is the follower, the action is on the recess of the teeth only, where friction is least. See GEAR WHEELS.

Exterior of Lantern, Salamanca Old Cathedral.

**Lanthanum.** La. At. wt. 138.2; sp. gr. 6.1; sp. ht. .044; valence III. Discovered by Mosander 1839. Rare metal, resembling iron in color and luster, found in cerite, lanthanite, and gadolinite. It is classed with the metals of the earths, aluminium, oscandium, etc.

**Lanthanum Carbonate.** $La_2(CO_3)_3+8H_2O$. Occurring in nature as lanthanite; obtained by adding a soluble carbonate to a soluble lanthanum salt as a gelatinous precipitate, which becomes crystalline on standing.

**Lanthanum Hydroxide.** $La(OH)_3$. White powder, obtained by precipitating lanthanum salts with caustic potash.

**Lanthanum Nitrate.** $La(NO_3)_3+6H_2O$. Large, transparent, triclinic columns, made by dissolving the oxide in nitric acid, and crystallizing.

**Lanthanum Phosphate.** $LaPO_4$. White precipitate, obtained from a solution of lanthanum sulphate on adding sodium phosphate.

**Lanthanum Sesquioxide.** $La_2O_3$. White powder or rhombic prisms, made by heating the nitrate, carbonate or metal.

**Lanthanum Sulphate.** $La_2(SO_4)_3$. White powder, made by heating the chloride with sulphuric acid.

**Lanthanum Trichloride.** $LaCl_3$. White crystalline mass, obtained by evaporating a solution of the oxide in hydrochloric acid with ammonium chloride and igniting.

**Lanthanum Trisulphide.** $La_2S_3$. Yellow powder, made by passing hydrogen sulphide over the oxide heated to redness.

**Lanugo.** Fine hair found on nearly all portions of the body save the palms and soles and similar localities.

**Lanyards.** Small ropes at the ends of the shrouds, by which they are hove taut.

**Lanza,** GIOVANNI, 1815–1882. Italian Deputy from 1848; member of several cabinets; Prime Minister 1869–73.

**Lanzi,** LUIGI, 1732–1810. Italian antiquarian. *Saggio di Lingua Etrusca,* 1789; *Storia pittorica d'Italia,* 6 vols., 1792–1806, tr. 1828.

**Laocoön.** An ancient statuary group of the Vatican represents the strangling of Laocoön and his two sons by serpents. He was the Trojan priest of Apollo, who foretold the destruction of Troy, if the gift of the wooden horse were accepted from the Greeks. The story is an episode of the Second Book of Virgil's *Æneid.* The sculptured group is a work of Greek decadence by artists of the Rhodian School, and was discovered in 1506. Lessing's Essay on Laocoön was considered by Macaulay the finest critical production in modern literature.

Laocoon.

**Laodamia.** Wife of Protesilaus, who after his death at Troy obtained his return for 3 hours, and then went with him to Hades; celebrated in one of Wordsworth's noblest poems.

**Laodicea.** City of s. w. Phrygia, on the Lycus; rebuilt and named by Antiochus II. 260 B.C.; held by the Romans from 133 B.C.; residence of Cicero 50–49 B.C.; long rich and populous; seat of a medical school and of one of the "7 Churches of Asia," denounced Rev. iii. 14–18 as lukewarm: meeting-place of two councils, 363 and 476; repeatedly injured by earthquakes; destroyed by Tamerlane 1402. Other cities bore this name, especially one in e. Phrygia or Lycaonia.

**Laomedon.** King of Troy, father of Priam. He was served by Poseidon and Apollo, but refused to pay them; and was slain by Hercules for similar bad faith.

**Laon.** Ancient town of France, 87 m. n. e. of Paris; last capital of the Carlovingian kings; taken by Henry IV. 1594. The French were defeated here by the Allies under Blücher, March 10, 1814. Pop., 1891, 12,959.

**Lâo-Tsze,** 6th century B.C. Chinese author of the treatise known as *Tâo Teh King;* reputed founder of the form of religion called Tâoism, although the latter is not in consonance with the simplicity and freedom from superstition which the treatise displays.

**Lap and Lead.** When the slide-valve of a steam engine has a length just equal to the distance between the extreme edges of the steam ports, it will admit steam to the cylinder throughout the entire stroke. If the valve be made longer, so as to more than cover the outer edges of the ports when in its central position, that amount at each end is called its lap. Its effect is to compel the expansive working of the steam, since the valve must be ready just to admit steam to one end of the cylinder when the piston is on that dead center, and this condition compels the valve to have closed the admission of steam to the other end while the shaft had still to move through an angle sufficient to cause the valve to slide over the length of the lap at both ends. Inside or exhaust lap is a similar projection of the inner edges of the exhaust cavity over the inner edges of the ports, so as to prevent too early release of the exhaust, and to cause exhaust compression or cushioning.

LEAD is the amount of port opening for the admission of boiler steam when the piston is on its dead center. Its effect is to increase an early cut-off due to lap, to produce a live-steam cushion to bring the reciprocating parts to rest without shock to the crank-pin, and to fill all steam passages at the beginning of the stroke. These latter objects can be better attained by proper exhaust compression. Excessive lead causes the engine to pound. Amounts of lap vary of course with the size of the engine and the valve. Amount of lead varies from $\frac{1}{16}$ to $\frac{3}{16}$ of an inch.

**Laparotomy.** Opening of the abdominal cavity to remove tumors, sew up wounded intestines, etc., and in some cases of obscure trouble to ascertain the condition of the organs. When performed with antiseptic precautions it is almost entirely free from danger.

**La Paz.** City of Bolivia, 40 m. e. of Lake Titicaca, at an elevation of 11,970 ft. above the sea. It is the commercial center of the republic. The department by this name contains rich gold mines and raises cattle and sheep in great numbers. Pop., 1890, 56,800.

Palace of Congress, La Paz.

**La Pérouse,** JEAN FRANÇOIS DE GALAUP. COMTE DE, 1741–1788. French naval officer, explorer in the Pacific 1785–88; lost near the New Hebrides. *Voyage,* 4 vols., 1797.

**La Péruse,** JEAN DE, ab. 1530–1555. French poet.

**Lapham,** INCREASE ALLEN, LL.D., 1811–1875. Chief geologist of Wisconsin 1873–75. *Description of Wis.,* 1844; *Grasses of Wis.,* 1853; *Antiquities of Wis.,* 1855.

**Lapidary Work.** Cutting and polishing of precious stones. Small cylinders of serpentine, and later of chalcedony, hematite, etc., variously engraved, were strung as necklaces by the Assyrians, who used drills charged with hard minerals as early as 730 B.C. Diamond-cutting was practiced in early times among the Hindoos and Chinese, but not in Europe until 1475. The finest lapidary work is now done in New York, London, Paris, and in the Jura; the best imitation stones are made in Paris, the Jura, Bohemia, and Providence, R. I.

**Lapidore.** Plants growing naturally in stony situations.

**Lapis Lazuli.** Deep-blue mineral substance, not very hard, found in Persia, Siberia, and other Eastern localities; used for ornamental articles and in mosaics. Its powder was called ultramarine; the modern pigment of that name is prepared artificially. Lapis lazuli is not now regarded as a homogeneous mineral, but as a mixture, the essential part of which is a sodium aluminium silicate with some sulphur, called Lazurite.

**Lapithæ.** Mythical folk in Thessaly governed by Pirithous,

a half-brother of the Centaurs. Upon his marriage with Hippodamia, the Centaurs attempted to carry off the bride and other women.

**Lap Joint.** Made by lapping the ends of two plates past each other and riveting them together. It usually has only ab. 60 per cent of the strength of the plates themselves.

**Laplace,** PIERRE SIMON, 1749–1827. Mathematician and physical astronomer of highest rank, called "the French Newton"; Senator 1799, Count 1805, Marquis 1817. His labors have had permanent influence on geology and cosmogony, as well as on mathematical astronomy. His chief work is *Mécanique Céleste*, 1799–1825. Others are *Mouvement et Figure des Planètes*, 1784; *Système du Monde*, 1796; *Théorie Analytique des Probabilités*, 1812–20.

**Laplace's Equation.** $D_x^2V+D_y^2V+D_z^2V=0$. The potential function V, due to any distribution of matter, must be such that at all points of empty space the value of V satisfies the above equation.

**Laplace's Formula.** For obtaining the difference in level between two stations from the indications of a barometer at the two points. If $x$ is the vertical height between the two stations, $\lambda$ the latitude of the latter, H the barometric height at the lower station, observed at temperature t, and $H^1$ the height of the barometer at the higher station, observed at temperature $t^1$, then

$$x=18393.(1+0.002837 \cos \lambda).\log \frac{H}{H^1}.\left(1+2\frac{t+t^1}{1000}\right).$$

**Lapland.** See LAPPS.

**La Plata.** City of Argentina, on the La Plata, 25 m. s. e. of Buenos Ayres; founded 1882, and already of commercial importance. Pop., 1889, 65,000.

**La Plata,** RIO DE. Formed by the union of the Uruguay and Parana rivers; between Uruguay and Argentina. Length ab. 200 m., width from 20 to 140 miles.

**La Porte du Theil,** FRANÇOIS JEAN GABRIEL, 1742–1815. French translator of Æschylus, 1794, Strabo, and other Greek authors.

**Lappaceous.** In Botany, burr-like structures.

**Lappenberg,** JOHANN MARTIN, 1794–1865. Keeper of Hamburg archives 1823–63. *Hanse Towns*, 1830; *Hist. England*, 1834–37, tr. 1845–57.

**Lappish Language.** Speech of the Laplanders, related closely to Finnish and more remotely to Hungarian; belonging to the Scythian family; it has numerous dialects.

**Lapps,** or LAPLANDERS. Race allied to the Finns, numbering ab. 30,000, and occupying the land adjacent to the Arctic Ocean in Europe from the White Sea westward. More than half are in Norway; these are the most civilized; many can read and write. Those on the sea coast are fishers; those along the rivers are farmers; those living in the forests and in the

Laplanders.

mountains are herdsmen and nomadic. Some own large herds of reindeer. In stature they average less than 5 ft.; the head is the most brachycephalic of any known race, the cephalic index ranging from 80 to 90. Their government is patriarchal. Their only vice is drunkenness.

**Laprade,** VICTOR DE, 1812–1883. French poet; prof. at Lyons 1847–61; Academician 1858.

**Lapse.** Loss of a right, as where a patron fails to present some person for a benefice within the required time, or when a devisee or legatee dies before the testator; determined by local statutes and decisions.

**Lapsed.** In the early Ch. those who had apostatized or denied the faith, chiefly in the pagan persecutions. Questions of their discipline and restoration occasioned serious schisms.

**Laramie Mountains.** Granitic range of s. Wyoming. Elevation 8,000 to 9,000 ft.

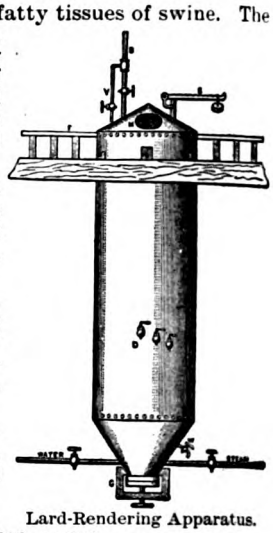
**Larboard.** Left side of a ship, looking toward the bow.

**Larceny.** Fraudulent taking and carrying away of another's personal property, with the intent to deprive him thereof. The technical rules of the common law have been variously modified by modern statutes, and the degrees and punishment prescribed, in each jurisdiction.

**Larch.** Trees of the genus *Larix*, natural family *Pinaceæ*, natives of the n. hemisphere.

**Larcom,** LUCY, 1826–1893. American poet; ed. *Our Young Folks*, 1865–74. *A New England Girlhood*, 1889.

**Lard.** Fat rendered from the fatty tissues of swine. The best quality is known as leaf lard, and is made from the fat enveloping the kidneys and lining the walls of the abdominal cavity. Commercial lard is often adulterated with cotton seed and other vegetable oils and water.



Lard-Rendering Apparatus.

**Lardner,** DIONYSIUS, LL.D., 1793–1859. Irish writer on science; prof. Univ. Coll., London, 1828–44; ed. *Cabinet Cyclopædia*, 132 vols., 1830–44.

**Lardner,** NATHANIEL, D.D., 1684–1768. English dissenter. His *Credibility of Gospel History*, 17 vols., 1727–57, is still valued. *Jewish and Heathen Testimonies*, 4 vols., 1764–67.

**Lareau,** EDMUND, b. 1848. Prof. of Law in McGill Univ., Montreal, 1876; writer on Canadian law and literature. *Melanges*, 1877.

**Laredo.** Capital of Webb co., Texas; on the Rio Grande. Pop., 1890, 11,319.

**Lares.** Inferior Roman divinities; tutelary spirits (perhaps Manes of the family raised to the dignity of heroes), presiding over the hearth and house. Public lares were protectors of a city, or of some portion of it.

**Largillière,** NICOLAS, 1656–1746. French portrait painter of great talent.

**Laridæ** (GULLS). Family of *Natatores*, having lightly-built, pigeon-like body, pointed wings, and often forked tail, three webbed toes, and one free hind toe. They dive from the air while in flight.

**Larissa.** Ancient city of Thessaly, on the Peneus; ceded to Greece 1881. Pop. ab. 13,000.

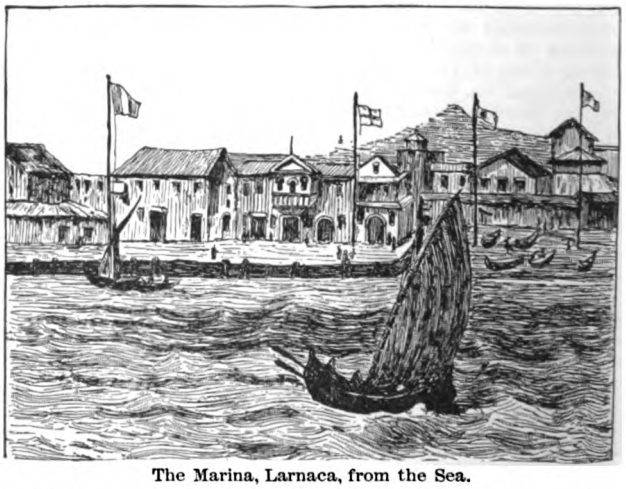
**Larivey,** PIERRE, ab. 1550–1612. French playwright. His nine comedies were skillfully adapted from the Italian.

**Larks.** This family includes over a hundred species, mostly Old World forms. Only the shore-larks (*Otocoris*), are indigenous to the New World. They sing during flight. *Alauda arvensa*, the European skylark, is destructive to sprouting crops. See ALAUDIDÆ.

**Larkspur.** Herbs of the genus *Delphinium*, natural family *Ranunculaceæ*, bearing showy, irregular flowers, natives of n. hemisphere.

**Larmier.** Gland situated in the lachrymal bone of deer, which secretes a waxy, strongly odorous substance.

**Larnaca.** Town and chief trading center near the s. coast of Cyprus. It has a good harbor; valuable salt lakes are



The Marina, Larnaca, from the Sea.

located here; salt, umber, opium, grain, cotton and wool are exported. With British occupation has come a great loss in trade. Pop. ab. 10,000.

**Larne,** PIERRE DE (also known as PETRUS PLATENSIS, PIERCHON, PIERSON, and PIERAZZON), eminent contrapuntist of the 15th and 16th centuries, a contemporary of JOSQUIN DES PRES (q.v.).

**La Roche,** MARIE SOPHIE (VON GUTERMANN), 1731–1807. German novelist.

**La Rochefoucauld,** FRANÇOIS (VI.), DUC DE, 1613–1680. French author, for a time a soldier of the Fronde. His *Maximes*, 1665–78, are famous for their cynical brilliancy. The *Memoirs*, 1662, are of mixed or dubious authorship.

**La Rochefoucauld-Liancourt,** FRANÇOIS ALEXANDRE FREDERIC DE, 1747–1827. French philanthropist, founder of industrial schools, savings banks, and model farms.

**La Rochejaquelein,** HENRI DU VERGER, COMTE DE, 1772–1794. Royalist leader in La Vendée.—His brother, LOUIS, MARQUIS DE, 1777–1815, commanded the royalist army in La Vendée 1814, and was killed in battle.—His widow, MARIE LOUISE VICTOIRE, 1772–1857, wrote memoirs of that campaign.

**La Rochelle.** See ROCHELLE.

**Laromiguière,** PIERRE, 1756–1837. Prof. at Toulouse and Paris. *Leçons de Philosophie*, 1815–18.

**La Rothière.** Village of n. e. France. Napoleon was defeated here by Blücher, Feb. 1, 1814.

**Larousse,** PIERRE, 1817–1875. French maker of schoolbooks, and of a vast cyclopedia, *Dict. du XIXe Siècle*, the latter half of which has been done by other hands.

**Larra,** JOSE MARIANO DE, 1809–1837. Spanish novelist, dramatist, and satirist.

**Larramendi,** MANUEL DE, 1690–1766. Spanish Jesuit, pioneer in the study of the Basque language. He pub. in 1745 a Spanish-Basque-Latin dictionary.

**Larrey,** DOMINIQUE JEAN, 1766–1842. Chief surgeon of the French army; Baron 1809; author of professional writings of high repute, and of devices which have been generally adopted.

**Lars.** Etruscan fore-name, meaning king or lord, as in Lars Porsena.

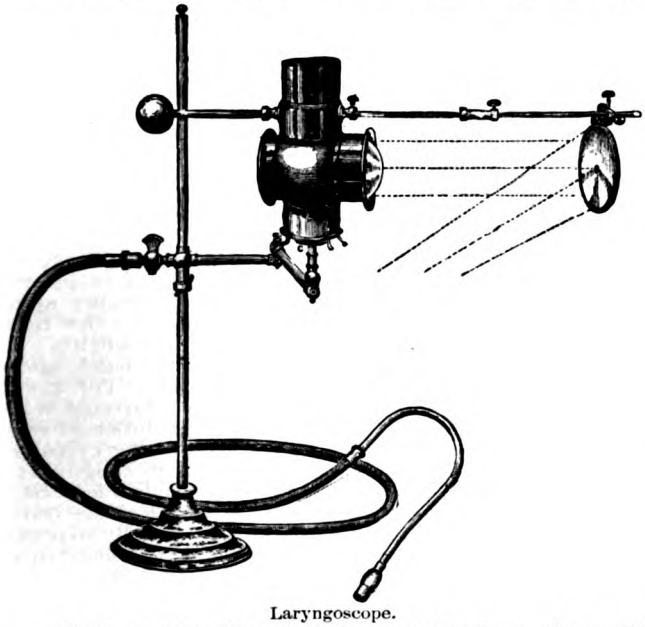
**Larva.** Immature young of an animal, especially when active and self-feeding, or remaining for a time in certain embryonic stages, after hatching from the egg; *e.g.*, the caterpillar of butterflies, grubs of beetles, maggots of flies, planula of corals, nauplius and zoea of *Crustacea*, pluteus of sea urchins, veliger of sea snails, tad-pole of frogs.

**Larvæ.** See LEMURES.

**Laryngismus Stridulus.** Condition in children, occurring by itself or as a symptom of laryngitis, in which there is a drawing in of the breath with a crowing sound, followed by a temporary cessation of the breathing.

**Laryngitis.** Inflammation of the larynx, characterized by hoarseness, dryness of the throat, difficulty in swallowing, pain, cough, and more or less fever. When chronic or very severe, it may result in loss of the speech, the person not being able to speak above a whisper or in a rough, harsh tone.

**Laryngoscope.** Instrument for examining the air-passages in the throat. It consists of a small plane mirror with a handle attached, by which it is held in the back part of the patient's mouth, and a concave mirror fixed to the observer's forehead, by means of which the light from a lamp is reflected upon the plane mirror, which again reflects it down the throat.



Laryngoscope.

**Laryngotomy.** Surgical opening of the larynx when it is obstructed above point of operation or for the removal of foreign bodies or growths.

**Larynx.** Tubular organ in the fore part of the neck having a framework of cartilages (thyroid, cricoid, epiglottic, arytenoid, cuneiform and cornicula larynges), united by muscles and ligaments. It is lined with mucous membrane, continuous above with that of the pharynx and below with that of the trachea. Above it connects with the pharnyx by a slit, the glottis, which is protected by the epiglottis. Immediately below the glottis are two folds, one on each side, termed true vocal cords. The air passing over these cords causes them to vibrate, thus producing sounds the note, etc., of which are changed by the alteration of the tension of the cords, a process effected by small muscles.

**La Salle,** RENE ROBERT CAVELIER, SIEUR DE, 1643–1687. French explorer, who discovered the Ohio River, and traced his way to the mouth of the Mississippi 1682. Returning to France, he laid before the king plans for colonizing the region; but misfortunes attended him, and he was murdered in Texas by some of his followers.

**Lasaulx,** ARNOLD VON, 1839–1886. Prof. Bonn; mineralogist and petrographer. *Elemente der Petrographie*, 1875; *Einführung in die Gesteinslehre*, 1885.

**Lascaris,** CONSTANTINE, d. 1493. Greek scholar, who came to Italy after the fall of Constantinople, and taught at Milan, Rome, and Naples. Greek grammar, 1476.

**Lascaris,** JOHANNES or JANUS, ab. 1445–1535. Greek teacher in Italy and France; ed. of several Greek authors. He aided in forming the Medicean Library at Florence, and the Royal Library of France.

**Lascaris,** THEODORE I. Byzantine Emperor 1222–55, ruling at Nicæa, the Empire being reduced to w. Asia Minor since the conquest of Constantinople by Venetians 1204; succeeded by his son, THEODORE II., 1255–59, and grandson, JOHN, 1259–61, who was blinded by Michael Paleologus.

**Lascars.** In India, camp-followers, or native sailors on British vessels.

**Las Casas,** BARTOLOME DE, 1474–1566. Spanish missionary and reformer in the New World, famous for his heroic and persistent efforts to defend the natives; Bp. of Chiapa in Mexico 1544–47, author of a MS. *History of the Indies*. He suggested the importation of African slaves, to save the Indians from extirpation.

**Las Cases,** EMMANUEL DIEUDONNE, COMTE DE, 1766–1842. French author, ennobled by Napoleon, with whom he spent the first year of exile. *Memorial of St. Helena*, 8 vols., 1821–23.

**Lasco,** JOHANNES A, ab. 1499–1560. Polish reformer, resident in the Netherlands 1538–49, in London 1549–53; from 1556 Supt. in Lesser Poland.

**La Serna y Hinojosa,** JOSE DE, 1770–1832. Spanish general in Peru 1816; last Viceroy, 1821–24.

**Lashkar.** Capital of Indian State of the same name, dominated since ab. 1750 by the Scindia family, and under English protection since 1803. It lies at the base of a rock, which, rising perpendicularly on all sides 340 ft. and measuring 300 yards by 1½ m., is said to have been held as a fort for ab. 1,000 years. It has a beautiful white limestone mausoleum. Pop., 1891, 85,040.

Mausoleum of the Scindias, at Lashkar.

**Lasker,** EDWARD, 1829–1884. Prussian Jew, Deputy from 1865, prominent Liberal. *Kulturentwickelung*, 1881.

**Las Palmas.** Chief town of the Canary Islands, on n. e coast of Gran Canaria. Pop. ab. 12,000.

**Lassa.** See LHASSA.

**Lassalle,** FERDINAND, 1825–1864. German socialist and agitator, founder of the social-democratic

movement there; writer of some importance on philosophy and jurisprudence. He entered upon his career of agitation 1862, using the teachings of Rodbertus and Marx, adding little except his own eloquence and vigor, and under prosecution from the government succeeded in starting a movement among the lower classes which has since constantly increased. He was killed in a duel near Geneva.

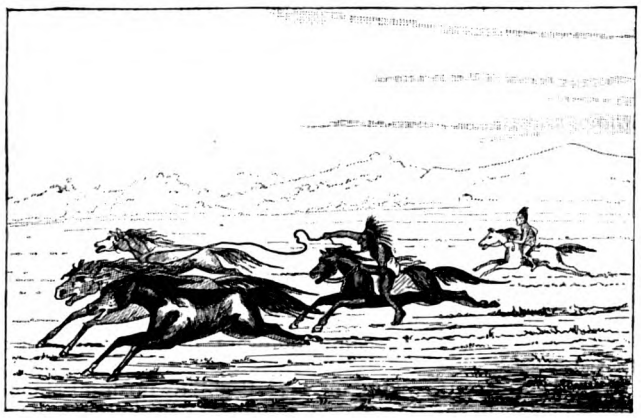
**Lassell,** WILLIAM, 1799–1880. English brewer and astronomer, discoverer of the satellite of Neptune, the two inner satellites of Uranus, and of the 7th satellite of Saturn independently of Bond, by whom it had been seen two days before.

**Lassen,** CHRISTIAN, 1800–1876. Philologist and orientalist, b. in Norway; prof. Bonn 1830–64; editor of Sanskrit books. *Anthologia Sanscrita*, 1838; *Indische Alterthumskunde*, 1844–61.

**Lassen,** EDWARD, b. 1830. Court Chapelmaster at Weimar 1861–95. *Landgraf Ludwig's Brautfahrt*, 1857. More successful than his three operas have been his songs and his incidental music for Hebbel's *Nibelungen*, Sophocles's *Œdipus Coloneus*, and Goethe's *Faust*.

**Lassen's Peak.** Volcanic summit of the Sierra Nevada, in Shasta co., Cal. Altitude 10,437 feet.

**Lasso.** Noosed rope used in S. America and Mexico to capture wild cattle, and sometimes for dueling or murder. Its



Lasso.

equivalent in the U. S. is the lariat. It is from 60 to 100 ft. long, and usually made of rope, horse hair, or rawhide.

**Lasso,** ORLANDO DI (ROLAND DE LATTUS), ab. 1520–1594. Chapelmaster of St. John Lateran, Rome, and of the ducal choir in Munich, where the Duke pub. a complete edition of his works; b. at Mons, and Palestrina's greatest contemporary in music.

**Lasson,** ADOLF, b. 1832. German writer on philosophy.

**Lassus,** JEAN BAPTISTE ANTOINE, 1807–1857. French architect.

**Lastarria,** JOSE VICTORINO, b. 1817. Chilian Minister of State, diplomatist, author, and journalist.

**Lasus,** 6th century B.C. Greek lyric poet of Argolis, eminent for his use of dithyrambs.

**La Taille,** JEAN DE, ab. 1540–1611. French playwright and poet.

**Latakia.** Seaport of Syria, anciently Laodicea; formerly noted for its exportation of tobacco. Pop. ab. 11,000.

**Latent Heat.** Amount of heat required to change a liquid at a given temperature into a gas at the same temperature and pressure. It is the heat necessary to do the work of vaporization or separation of the particles, and their dispersion into the increased volume which they occupy. Being an amount of heat corresponding to a molecular work, it is not detectable by the thermometer, and so seems to be concealed, but its presence is revealed at once upon the conversion of the vapor back into a liquid. There is also a less familiar latent heat of fusion, which is necessary and disappears in melting a body from a solid to a liquid, and a latent heat of expansion, which disappears in causing the volume of a gas to increase under a given pressure. It is probably this latent heat which causes variation of the specific heats of solids and liquids as the temperatures rise.

**Lateral.** That which belongs to the side as distinguished from the base, as the lateral faces and edges of a pyramid, which meet at the vertex.

**Lateral Bracing.** That connecting the two upper or the two lower chords of a bridge in order to stiffen it against wind and the oscillations caused by traffic.

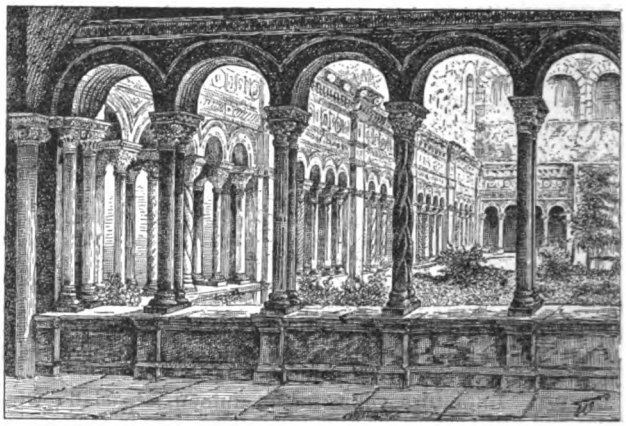
**Lateral Fin.** Supposed ridge or fin on the sides of the body of primitive *Chordata*, from which the four limbs of vertebrates have been specialized.

**Lateral Inversion.** Phenomenon of reversal produced when objects are viewed by their reflections in a plane mirror. To a person standing in front of a mirror, *e.g.*, the right hand appears on the left. The natural order may be restored by two reflections.

**Lateral Line.** 1. Along the sides of fishes, supplied by a branch of the tenth pair of cranial nerves. Each scale on this line has an oblique perforation, containing sensory cells that connect with the underlying nerve. 2. Lines in nematode worms, along which two of the six pairs of anterior nerves proceed from the circumœsophageal nerve ring. They have the value of segmental organs.

**Lateran.** Palace in Rome, named from the family to whom it belonged until Nero seized it; residence of the Popes 312–1309; rebuilt by Sixtus V. 1586.

**Lateran Church.** Roman archbasilica of St. John on the Lateran hill, in which stands the Pope's cathedra; con-



Cloister of St. John Lateran.

sidered the mother Ch. of Christendom, outranking even St. Peter's. The Lateran palace adjoins it; both have been destroyed and rebuilt.

**Lateran Councils.** I. 1123, concerning investitures. II. 1139, to depose an antipope. III. 1179, to determine election of popes. IV. To condemn the Waldenses and order a crusade; it used the word transubstantiation. V. 1512, revoking the decrees of that of Pisa.

**Lateran Museum.** In a portion of the Lateran Palace; founded by Pius IX. for early Christian and classic art. Here are the famous statue of Sophocles and the finest collection of classical architectural fragments. It leads the world in Christian inscriptions; its sarcophagi are equaled only in Arles and in Ravenna.

**Laterigradæ.** See SPIDERS.

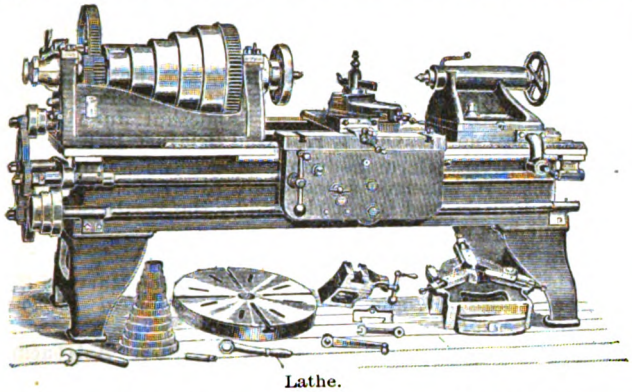
**Latex-Cells.** Receptacles of the lactiferous or milky juices in plants, as the Milkweed, India-rubber plants, and Spurges. They are generally elongated, branched, tubular cells, and have very thin cell-walls.

**Latham,** JOHN, F.R.S., 1740–1837. English ornithologist. *History of Birds*, 10 vols., 1821–24.

**Latham,** ROBERT GORDON, M.D., 1812–1888. Prof. Univ. Coll., London, 1839; writer on the English language and on British and European ethnology; pensioned 1863. He held to the European origin of the Aryan race.

**Lathe.** Tool whose principal function is to produce surfaces of revolution in wood or metal. The work is supported between centers and caused to revolve at the proper speed, while a tool is held in a suitable rest and removes the material which projects outside the surface which is sought. For work in wood, the tool or gouge is held in the hand upon a rest, and the work revolves at very high speed. For metals the speed is slow and the tool is borne upon a carriage which slides upon ways parallel to the axis of the revolution of work. The tool can be fed along the work for producing cylinders, across it for plane ends of cylinders, and in many designs at an angle also. By properly adjusting the longitudinal feed of the tool to the rotation of the work, the lathe can originate helices of any pitch, and is much used to cut screws. By adjusting one end of the axis of the machine sidewise, the longitudinal motion of the tool will cause it to cut a conical surface. Drilling, boring, and grinding can also be done on a lathe. A vertical lathe is one in which the axis of the machine is vertical. Such tools have their face-plates on the end of the revolving spindle in a horizontal plane, and the operations of centering

are much simplified (see BACK GEAR and CONE PULLEYS). A chucking lathe is one in which the bed is short, and work is to be done mostly on the face-plate. A gap-lathe is one in which a part of the bed near the face-plate is removable, so as to ad-



Lathe.

mit of handling work of greater diameter at that part than can be taken in over the rest of the bed (see BLANCHARD LATHE and TURRET LATHE). Lathes can also be made into special tools adapted for one class of work in manufacturing.

**Lathrop,** FRANCIS, b. 1849. American painter, decorator, and artist in stained glass.—His brother, GEORGE PARSONS, b. 1851, and his wife, ROSE (HAWTHORNE), b. 1851, have written much in prose and verse.

**Latimer,** CHARLES, 1827–1888. American civil engineer, inventor of the apparatus for returning to the rails a derailed train.

**Latimer,** HUGH, ab. 1490–1555. Chaplain to Henry VIII. 1530, Bp. of Worcester 1535–39; twice imprisoned. The boldest and most effective of the reforming preachers, he refused to resume his bishopric under Edward VI., was imprisoned at Mary's accession, and burned at Oxford with Ridley Oct. 16, 1555. His ending was triumphant; his last utterance was a famous watchword of the Reformation: "Be of good comfort, Master Ridley, and play the man; we shall this day light such a candle by God's grace in England as I trust shall never be put out."

**Latin Empire.** Established by the Crusaders at Constantinople 1204; displaced by the restored Byzantine Empire 1261.

**Latini.** People of Latium, leagued against Rome 358–340 B.C.

**Latini,** BRUNETTO, d. ab. 1295. Florentine poet; author also of a long book in French, *Le Trésor*.

**Latin Language.** Italic dialect closely related to Umbrian and Osean. Down to 240 B.C. there are only inscriptions and a few more or less doubtful texts. As Roman literature grew, the vocabulary took in a host of Greek words. Classical Latin extends from ab. 200 B.C. until A.D. 150, including such writers as Tacitus, Suetonius, and the younger Pliny. Latin of the later Empire shows signs of decay, and passes imperceptibly into mediæval Latin. The popular speech (lingua rustica) had always differed from literary Latin, which has been maintained down to the present day by the R.C. Ch. and by scholars; while the lingua rustica became the foundation of the Romance languages.

**Latin Language** IN CHURCH SERVICES. Result of Roman conservatism. The Greek Church, though having a more flexible language, does not insist upon its use in the Mass. The Latin of the Mass is regarded by Rome as commendable, not absolutely necessary, nor required by her in the East.

**Latin Literature.** The Romans had very little indigenous literature. The rude songs and Fescennine verses in Saturnian meter did not deserve that title. A Greek, Livius Andronicus, who 240 B.C. produced a play adapted and translated from the Greek, and later rendered the *Odyssey*, gave the first impulse to Latin composition. Nævius wrote comedies: Ennius produced tragedies, satires, and an epic poem, *Annales*. Under Plautus the comedy was developed, and Terence refined it still further. M. Porcius Cato may be regarded as the father of Latin prose, and he endeavored to improve oratory. His *Origines* constituted the first literary work upon history. The Golden Age, which extends to the death of Augustus, comprises two sub-divisions, the republican and the Augustan. During the former Cicero was the most imposing figure. He not only was the greatest of Roman orators, but, by his labors in philosophy, did much to make Latin a proper vehicle for expressing the delicate conceptions of the Greeks. Cæsar was a writer and orator of no mean ability. Sallust composed historical works of merit. Lucretius, in his great epic, *De Rerum Natura*, sought to teach the philosophy of Epicurus, and displayed both great power of abstract thought and a vigorous imagination. Catullus has left a number of beautiful love poems. Under Augustus the favors of the court were lavished upon authors, and Virgil composed his immortal *Æneid*, with the *Georgics* and *Eclogues*. Ovid, though morally much inferior to Virgil, was a master of versification, while Horace adapted to the Latin tongue the varied meters of the Greeks. Tibullus and Propertius wrote lyrics. In the department of history, Livy published his great work. The Silver Age, to the time of Marcus Aurelius, produced some writers of power, though the tyranny of evil emperors gradually destroyed literary activities. Thus Perseus and Juvenal lashed the vices of their times in satires, and Statius wrote lengthy epics. Seneca and Lucan, Petronius and Silicus, are names of note. Pliny and his nephew, Quintilian and Martial, were all important in their several directions. Tacitus produced his magnificent historical works, which recall the terseness and insight of Thucydides. Finally, Aulus Gellius and others show that erudition, as opposed to creative genius, was to be the type of the period of decadence, often called the Iron Age, which lasted until the incursions of the barbarians drove all learning into the monasteries, and the long night of the Middle Ages descended upon Europe. During the last period, however, law, which had been the special pride of Rome, was developed, until the great codes of the emperors Theodosius and Justinian were evolved to influence legal science for all succeeding time.

**Latin Quarter.** Name applied by Balzac to that part of Paris on the left bank of the Seine once under the control of the University of Paris and which really constituted a city

Hotel de Cluny.

within a city. It is now noted for its Bohemian aspects. Among its famous buildings are the Hôtel de Cluny, St. Etienne du Mont, the Pantheon, and the Sorbonne.

**Latin Union.** Combination of France, Italy, Belgium, and Switzerland, and subsequently Greece, to determine a standard of proportion between the value of gold and silver in their coinage; formed 1865. Silver and gold were coined freely at the ratio of 1 of gold to 15.5 of silver till 1874; since then their coinage of silver has been either much limited or entirely suspended.

**Latin Wars.** The Latins joined in an attempt to restore Tarquin 508 B.C., and were defeated by Romans at Lake Regillus 498 B.C. A later war lasted from 358 to 340 B.C.

**Latitude,** LENGTH OF A DEGREE OF. This increases from the equator toward the pole, being 362,757 ft. at the equator, 364,606 ft. at 45°, and 366,471 ft. at the poles.

**Latitude,** TERRESTRIAL. The Astronomical latitude of a point on the earth's surface is the angle made with the plane of the equator by a plumb line at the point.—The Geographical latitude is the angle made with the plane of the equator by a normal to the earth's surface at the point. (These would be the same if there were no local deviations of the plumb line due to attraction of mountains and other causes.)—The Geocentric latitude is the angle formed with the plane of the equator by the line drawn from the point to the earth's center. As the earth is not a sphere, this will not be a normal.

**Latitude,** VARIATION OF. The axis about which the earth performs its diurnal rotation is not a fixed line, but has itself a slow rotation about the axis of figure, in the same direction as the diurnal motion, analogous to that of a spinning top not accurately balanced. This produces small periodic changes in the latitudes of all points on the earth's surface, the maximum

range, or amplitude, being five or six-tenths of a second of arc. According to Chandler, these changes are due to two distinct rotations of the axis, superposed one upon the other, having periods of ab. 365 and 428 days respectively: the amplitude of each being somewhat less than one-third of a second of arc. These sometimes act together, producing a maximum amplitude of ½ or ⅔ of a second; sometimes they practically destroy each other. There are indications that these motions, one or both of them, are more or less elliptical. Thus the actual motion appears to be quite complex, but the quantities involved are so small that it is difficult to determine these points with precision. There are also some evidences of progressive changes of latitudes, but as yet they cannot be regarded as conclusive.

**Latitude of a Star,** CELESTIAL. Its distance from the ecliptic, measured on a great circle of the celestial sphere passing through the star and perpendicular to the ecliptic. See CO-ORDINATES, SPHERICAL.

**Latitudinarians.** Cambridge Platonists and others in England since ab. 1650, who put less stress on doctrinal opinions than on character and conduct, and would unite rather than separate.

**Latium.** Now Campania; on the coast of Italy, s. of the Tiber. The Latins had a league of 30 states; their struggle with Rome began 510 B.C., and ended 340 B.C. They gained Roman citizenship 90 B.C.

**Latona,** or LETO. Mother of Apollo and Artemis by Zeus. Hated by Hera, she found a home in Delos.

**Latour d'Auvergne,** THÉOPHILE MALO CORRET DE, 1743–1800. French captain of grenadiers, eminent for disinterested valor; killed in Bavaria. Till 1814 his name was called at muster-roll, and the senior sergeant answered, "Dead on the field of honor."

**Latreille,** PIERRE ANDRE, 1762–1833. French entomologist. *Insectes*, 1796; *Cructacés et Insectes*, 14 vols., 1802–5.

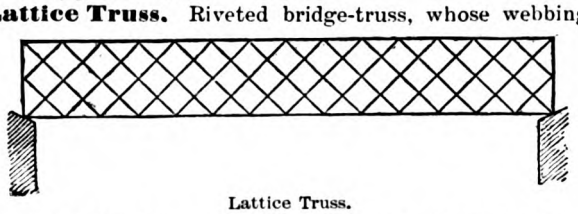
**Latro,** MARCIUS PORCIUS, d. 4 B.C. Roman orator.

**Latrobe,** BENJAMIN HENRY, 1764–1820. Anglo-American architect, employed on the Capitol at Washington.

**Latter-Day Saints.** See MORMONS.

**Lattice Leaf.** *Ouvirandra fenestralis.* Aquatic herb of the natural family *Naiadaceæ*, native of Madagascar; its leaves are strongly reticulated.

**Lattice Truss.** Riveted bridge-truss, whose webbing is



Lattice Truss.

formed of inclined members crossing each other; mainly used for spans between 100 and 200 ft. in length.

**Latus Rectum.** Principal parameter of a curve; line through the focus, perpendicular to the transverse axis and limited by the curve.

**Laube,** HEINRICH, 1806–1884. German dramatist; director of theaters at Vienna and Leipzig 1849–79.

**Laud,** WILLIAM, D.D., 1573–1645. Dean of Gloucester 1616; Bp. of St. David's 1621, of Bath and Wells 1626, of London 1628; Prime Minister 1628; Abp. of Canterbury 1633; impeached and imprisoned Dec. 1640; beheaded Jan. 10, 1645. As an ecclesiastic he cherished an ideal which has since been measurably realized in the Ch. of England by measures far different from his; as a statesman he was blind, incapable of estimating facts and possibilities, advising and urging a course of foolish and odious tyranny, whose result was to destroy all that he held dear. His character, which has been blindly venerated by one party and fiercely denounced by another, was honest and devout, but lacking in human sympathy: his mind was that of a narrow and superficial bigot, delighting in a system of interference and petty persecution which, in Englishmen of that age, could only rouse angry resistance. He and Strafford were the main causes of their master's (Charles I.) fall.

**Laudanum.** Tincture of opium. Preparation obtained by extracting one part of opium with ten of alcohol. It contains all of the properties of opium, and may be given to adults in 20-drop doses.

**Lauder,** ROBERT SCOTT, 1803–1869. Scottish painter, as was also his brother, JAMES ECKFORD, 1812–1869.

**Lauder,** SIR THOMAS DICK, 1784–1848. Scottish novelist. *Morayshire Floods*, 1830; *Tales of the Highlands*, 1841.

**Lauder,** WILLIAM, d. 1771. Literary forger, who accused Milton of plagiarism.

**Lauderdale,** JAMES MAITLAND, EARL OF, 1759–1839. M.P. 1780, Earl 1789; Chancellor of Scotland 1806–7; extreme liberal, opposed to the war with France. *Public Wealth*, 1804.

**Lauderdale,** JOHN MAITLAND, DUKE OF, 1616–1682. Earl 1645; Scottish Commissioner 1647; in English prisons 1651–60; Sec. of State in Scotland 1660–80; Duke 1672; detested for his tyranny and vices.

**Laudon,** or **Loudon,** GIDEON ERNST, FREIHERR VON, 1717–90. Austrian general, who defeated the Prussians at Kunersdorf, Aug. 12, 1759, and at Landeshut, June 23, 1760. He took Schweidnitz, Oct. 1, 1761, and Belgrade 1789.

**Lauenburg.** German duchy, on the Elbe; founded 1260 by Saxons. It belonged successively to Gt. Britain, France, Hanover, Prussia, and Denmark, and by the treaty of Gastein, 1865, came by purchase to Prussia.

**Laughing Gas.** See NITROUS OXIDE.

**Laughlin,** JAMES LAWRENCE, b. 1850. Prof. Harvard 1883–87, Cornell 1890–92, and Chicago 1892. *Political Economy*, 1885–87; *Hist. of Bimetallism in the U. S.*, 1885.

**Laugier,** AUGUSTE ERNEST PAUL, 1812–1872. Astronomer, long at the Paris observatory.

**Launch.** Largest boat belonging to a ship.

**Launder.** Rectangular box or trough employed in ore-dressing, which, when in use, is slightly inclined, so that the heavier grains of ore may collect at the upper end; also trough, in general.

**Lauraceæ.** Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Dicotyledons*, comprising 42 genera and ab. 900 species, found in the warmer countries of the whole earth, called the Laurel family.

**Laureate,** POET. Nominal office in England, formally instituted 1619 with a small salary and an annual hogshead of wine attached. Its duty, an ode on the king's birthday, was abolished ab. 1800, when £27 was substituted for the wine. The incumbents have been Spenser, 1591; Daniel, 1599; Jonson, 1619–37; Davenant, 1660; Dryden, 1670; Shadwell, 1689; Tate, 1692; Rowe, 1715; Eusden, 1718; Cibber, 1730; Whitehead, 1757; Warton, 1785; Pye, 1790; Southey, 1813; Wordsworth, 1843; Tennyson, 1850; Austin, 1895. A few of these names are among the greatest, several of them are among the least, in English literature.

**Laurel.** *Laurus nobilis.* Large tree of the natural family *Lauraceæ*, with glossy, evergreen leaves, native of s. Europe; known as Bay Laurel and Sweet Bay.

**Laurel,** CHERRY. *Prunus laurocerasus.* Small tree or shrub of the Cherry family, with thick, evergreen leaves; native of Europe; much planted for ornament.

Common Cherry-Laurel (*Prunus laurocerasus*).

**Laurel,** GREAT. In N. America, large-leaved and showy-flowered shrubs of the genus *Rhododendron*, especially *R. maximum*.

**Laurel,** MOUNTAIN. *Kalmia latifolia.* Showy-flowered shrub of the natural family *Ericaceæ*, native of e. N. America; known as Calico Bush and Spoonwood.

**Laurel,** SHEEP. See LAMBKILL.

**Lauremberg,** JOHANN, 1590–1658. German satirist; prof. at Rostock and Soroe.

**Laurence,** RICHARD, D.D., D.C.L., 1760–1838. Prof. Oxford 1814, Abp. of Cashel 1822; Orientalist. *Book of Enoch*, 1821.—His brother, FRENCH, LL.D., 1757–1809, was law prof. at Oxford 1796. *Correspondence with Burke*, 1827.

**Laurens,** HENRY, 1724–1792. Patriot of S.C.; delegate to Congress, and its pres. 1777–78; in an English prison 1780–81; Peace Commissioner in Paris 1782.—His son, JOHN, 1753–1782, served gallantly through the war, and fell in one of its latest skirmishes.

**Laurens,** JEAN PAUL, b. 1838. French painter.

**Laurent,** AUGUSTE, 1807–1853. Prof. of Chemistry at Bordeaux; warden of the Paris mint. He published many chemical papers.

**Laurent,** PAUL MATHIEU, 1793–1877. French judge and author. *Histoire de Napoléon*, 1828.

**Laurentian.** Hard, crystalline, much contorted rocks, sometimes 30,000 ft. thick, extensively exposed in the n. parts of N. America and in Europe, and believed to underlie all other continental formations. In the upper part occur limestone and graphite, which, according to T. Sterry Hunt, indicate vegetable and animal life. See ARCHÆOPHYTON and EOZOÖN.

**Laurentius.** Antipope 498.

**Laurentius,** or **Lawrence,** ST. Spanish deacon, treasurer of the Ch. at Rome 257, said to have been broiled on a gridiron. Philip II. built the Escorial in his honor. His day is Aug. 10.

**Laurer's Canal.** Vaginal tube in connection with the female sexual apparatus and the testis in certain hermaphrodite Trematodes.

**Laurestinus.** *Viburnum tinus.* Shrub of the Honeysuckle family, native of Europe; planted for ornament.

**Lauric Acid.** $C_{12}H_{24}O_2$. Mpt. 43.5° C. Fatty acid, occurring combined with glycerin in laurel oil, cocoanut oil, and other fats; obtained by their decomposition; solid. The sodium salt is a favorite soap, and is used for washing in salt water. The ethyl ester has a fruit-like odor.

**Laurie,** SIMON SOMERVILLE, LL.D., b. 1829. Prof. Edinburgh 1876; writer on education.

**Laurinol.** Chinese camphor.

**Lauriston,** ALEXANDRE JACQUES BERNARD LAW, 1768–1828. French general, prominent in Napoleon's wars; Marquis 1817, Marshal 1821.

**Laurium.** Hill of Attica, 1,170 ft. high, anciently and since 1863 mined for silver.

**Lausanne.** City of Switzerland, near the lake of Geneva, at an altitude of 1,700 ft. It is famous for its educational

Lausanne, from the English Church.

institutions and Gothic cathedral, begun in the 10th century and completed in the 13th. Voltaire Haller, and Gibbon resided here. Pop., 1893, 35,623.

**Laussedat,** AIME, b. 1810. Prof. Paris 1861, Colonel 1874; engineer and inventor.

**Lauzun,** ANTOINE NOMPAR DE CAUMONT, DUC DE, 1633–1723. French courtier and intriguer, twice imprisoned.

**Lauzun,** ARMAND LOUIS DE GONTAUT, DUC DE, 1753–1794. French officer, serving in America and La Vendée; guillotined. *Mémoires,* 1822.

**Lava.** Stone which flows in a melted state from a volcano.

**Lavalley,** ALEXANDRE, 1821–1892. French engineer, connected with the Suez Canal 1867–75; Senator 1885.

**La Valliere,** LOUISE FRANCOISE DE LA BAUME LE BLANC, 1644–1710. Mistress of Louis XIV. of France 1661; made Duchess 1666. She entered a convent 1674.

**Laval University.** At Quebec, under R. C. direction; chartered 1852. It offers courses in theology, law, medicine, and arts in both Quebec and Montreal, and has a school of science in Montreal with many affiliated schools of lower grade throughout the province. It has a library of 90,000 vols.

**Lavater,** JOHANN KASPAR, 1741–1801. Pastor at Zurich, poet, and writer on physiognomy. *Physiognomische Fragment,* 4 vols. 1775–78, tr. 3 vols. 1793; *Aphorisms,* 1787.

**Laveleye,** ÉMILE LOUIS VICTOR DE, 1822–1892. Prof. of Political Economy at Liege from 1864. He has written on land tenure, currency, education, and existing institutions. *Property,* 1874, tr. 1878; *Socialism,* 1881, tr. 1885; *The Balkans,* 1886, tr. 1887.

**La Vendée.** See VENDÉE.

**Lavender.** *Lavendula vera.* Narrow-leaved shrub of the Mint family, native of the Mediterranean region. Oil of Lavender is distilled from its flowers.

**Lavender,** SEA. *Statice limonium.* Plant with lavender-colored flowers, of the natural family *Plumbaginaceæ,* growing in salt meadows; of wide distribution; known as Marsh Rosemary.

**Laver.** *Porphyra vulgaris.* Purple sea-weed of the n. hemisphere, used as a vegetable in Europe and by the Chinese.

**Laver.** Bronze reservoir, placed in the court of the Hebrew Tabernacle, and afterward of the Temple, for ablutions of the officiating priests. Solomon cast ten such lavers, each holding some 320 gallons.

**Laveran,** LOUIS, M.D., 1812–1879. French military surgeon, teacher, and writer. *Mortalité des Armées.*—His son, ALPHONSE, M.D., b. 1843, has pursued similar studies, and discovered, 1881, the micro-organism causing malarial fevers. *Du Paludisme,* 1891.

**Lavergne,** LÉONCE GABRIEL, 1809–1880. French politician and economist, writer on agriculture and land holding. *L'economie rurale de l'Angleterre, de l'Ecosse, et de l'Irlande; Economie rurale de la France depuis 1789,* 1860.

**Lavigerie,** CHARLES MARTIAL ALLEMAND, 1825–1892. Prof. Paris 1854–61; Bp. of Nancy 1863, and of Algiers 1867; made Abp. and Cardinal; noted for his attempt to evangelize the Arabs, and for his crusade against the slave-trade.

**La Villemarqué,** THEODORE CLAUDE HENRI HERSART, VICOMTE DE, b. 1815. Collector of Breton ballads and legends.

**Lavinia.** Daughter of Latinus, King of Latium; wife of Æneas.

**Lavisse,** ERNEST, b. 1842. French historian, mostly of Germany; Academician 1892. *Political Hist. of Europe,* 1890, tr. 1891.

**Lavoisier,** ANTON LAURENT, 1743–1794. French chemist, Academician 1768; Farmer-gen. 1769. His earliest chemical work was to prove that water could not be transformed into earth. He recognized and insisted upon the value of the bal-

Anton Laurent Lavoisier.

ance in chemical operations. His greatest work was the recognition and explanation of the rôle played by oxygen in the phenomena of combustion. He was guillotined May 8, 1794. *Traité de Chimie,* 1789; *Works,* 4 vols., 1864–68.

**Law.** 1. In science, regularity of coexistence and sequence in the occurrence of events; sometimes seeming to denote a force or agent, but in reality no more than modes of action, abstracted from things. 2. Rule of human conduct enforceable by the State. It may be written or unwritten, constitutional or statutory: may be abrogated by express enactment or by implication.

**Law,** MOSAIC. Body of precepts, moral, civil and ceremonial, contained in Exodus, Leviticus, Numbers, and Deuteronomy. Whether these were all written by Moses, or whether there have been very large additions to an original Mosaic scheme, is a point now much debated, the weight of scholarship inclining the latter way.

**Law,** EDMUND, D.D., 1703–1787. Prof. Cambridge 1756; Bp. of Carlisle 1768; philosophical and theological writer.

**Law,** GEORGE, 1806–1881. American financier, owner of steamships on the Pacific.

**Law,** JOHN, 1671–1729. Scottish financier, author of a plan for a State bank, which found no favor in Scotland, but was taken up 1715 by the French government under the Regent. Its original principles were soon buried in a mass of wild specu-

lation, in which L. and his bank were involved in the form of the Mississippi Company, which burst 1720 with unprecedented losses and suffering. L. left France and wandered over Europe, dying at Venice.

**Law,** RICHARD, LL.D., 1733–1806. Delegate to Congress 1777–78 and 1781–84; Justice of Conn. Supreme Court 1784, Chief-Justice 1786; U. S. District Judge from 1789.—His father, JONATHAN, 1674–1750, was Chief-Justice 1725, and Gov. of the colony from 1741.

**Law,** WILLIAM, 1686–1761. English theologian and mystic. After refuting Bp. Hoadly, 1717, and Mandeville's *Fable of the Bees*, 1723, he wrote the famous *Serious Call*, 1729, and other devotional books, some of which expound the doctrines of Jacob Behmen.

**Lawes,** SIR JOHN BENNETT, 1814–1892. English agricultural investigator, Baronet 1882. He founded 1843 the Rothamsted experiments concerning animal nutrition and the effect of artificial fertilizers, which have since been continued without interruption and will be perpetuated through the terms of the Lawes Trust. The results, originally published in scattered papers in the Philosophical Transactions, the Journal of the Royal Agricultural Society, and the British Association Reports, have been collected in 9 vols.

**Lawfeldt.** Town near Maestricht, Belgium; scene of defeat of Austrian, Dutch, and English under the Duke of Cumberland by the French under Saxe, July 2, 1747.

**Law of Arago.** See ARAGO'S LAW.

**Law of Avogadro.** See AVOGADRO, AMADEO.

**Law of Continuity.** See HYDROKINETICS.

**Law of Cosines.** The intensity per unit of area upon a surface of any effect propagated in straight lines is proportional to the cosine of the inclination of the given surface to a plane normal to the direction of propagation; *e.g.*, the intensity of illumination of a screen placed oblique to the rays is subject to this law.

**Law of Definite Proportions.** A given chemical compound always contains the same elements in the same proportion by weight. This law was established at the beginning of the 19th century.

**Law of Gravitation.** See GRAVITY.

**Law of Inverse Squares.** When any two variables are so related that one varies inversely as the square of the other, the relation is said to be governed by this law: *e.g.*, two quantities of matter attract each other with a force that decreases as the square of the distance between them increases, and we may express the relation between the force and the distance by the variation equation

$$f \propto \frac{1}{d^2}.$$

This is the law of change for all forms of force which radiate from a center.

**Law of Malus.** If a beam of light polarized by reflection is incident upon a second reflecting surface at the polarizing angle, the intensity of the reflected beam will depend upon the angle made by the two planes of reflection. The law according to which the intensity varies was discovered by Malus and verified by Arago, and is as follows: "The intensity of the twice reflected beam varies as the square of the cosine of the angle formed by the two planes of reflection."

**Law of Maximum Efficiency.** See LAW OF SIEMENS.

**Law of Maximum Work.** See JACOBI'S LAW.

**Law of Multiple Proportions.** When two elements, A and B, combine to form several compounds with each other, if we consider any fixed amount of A, then the relative amounts of B which combine with this fixed amount of A bear a simple ratio to each other. This law was announced by JOHN DALTON (q.v.) 1804.

**Law of Nature.** See NATURAL LAW.

**Law of Siemens,** or LAW OF MAXIMUM EFFICIENCY. The useful power developed by an electric motor is to the power expended upon it by the generating dynamo as the counter electromotive force developed by the motor is to the elecromotive force of the generator; or, if the motor and generator be of the same construction, this ratio is that of the speeds of rotation of the two.

**Law of Sines.** See REFRACTION.

**Law of Storms.** Winds blow around and in toward the center of a storm in an incurving spiral, so that the storm as a whole appears to rotate against the hands of a watch or against the sun in the n. hemisphere, but contrariwise in the s. According to the older cyclonologists, the storm-center is on one's left hand when the wind blows on one's back.

**Law of the Winds.** Established by Buchan 1868 from observation, but by Ferrel 1858 by theory, that the winds are inclined to the isobars and deviate to the right as they blow from high to low pressures. See FERREL'S LAW.

**Lawrence.** Capital of Douglas co., e. Kansas, on the Kansas River; founded by Free-soilers 1854; prominent in the anti-slavery troubles attending the organization of the State; burned by guerrillas 1863. The State univ. was founded here 1864. Pop., 1890, 9,997.

**Lawrence.** City of Essex co., Mass., on both banks of the Merrimack River. Its leading industries are manufactures of cotton and woolen goods. It was incorporated in 1847, and chartered in 1853. Pop., 1890, 44,654.

**Lawrence,** ABBOTT, 1792–1855. Boston merchant: M.C. 1835–37 and 1839–41; U. S. Minister to England 1849–52; founder of Lawrence, Mass., 1844, and of the Lawrence Scientific School at Harvard 1847.—His brother, AMOS, 1786–1852, was noted for his benefactions, as were his sons, WILLIAM RICHARDS, 1812–1885, and AMOS ADAMS, 1814–1886. Lawrence, Kan., was named from the latter.

**Lawrence,** EUGENE, 1823–1894. Historical writer.

**Lawrence,** GEORGE ALFRED, 1827–1876. English novelist. *Guy Livingstone*, 1857; *Sans Merci*, 1866; *Hagarene*, 1874.

**Lawrence,** SIR HENRY MONTGOMERY, 1806–1857. B. in Ceylon. He took part in the Afghan and Sikh wars, filled various administrative offices in India 1846–57, and conducted the famous defense of Lucknow, until mortally wounded. He founded and endowed 4 military asylums, and was called "the noblest man that has lived and died for the good of India." *Adventures*, 1845.—His brother, JOHN LAIRD MAIR, LORD, 1811–1879, was in India from 1829, Lieut.-gov. of the Punjab 1849–58, and rendered great services in the Sepoy rebellion. He was pensioned and made Baronet 1858, Privy-councilor 1859, Viceroy of India 1863–68, Baron 1869. He opposed the policy which led to the Afghan war.—An elder brother, SIR GEORGE, 1805–1884, served in India till 1867. *Forty-three Years' Service*, 1874.

**Lawrence,** JAMES, U. S. N., 1781–1813. Commander of the *Hornet* at the capture of the *Peacock*, Feb. 24, 1813; mortally wounded on the *Chesapeake* in an unsuccessful contest with the *Shannon* June 1. "Don't give up the ship," was his last appeal.

**Lawrence,** SIR THOMAS, 1769–1830. English portrait-painter, ranking just below Reynolds and Gainsborough; R.A.

Master Lambton, by Sir Thomas Lawrence.

1798, knighted 1815, Pres. R. A. 1820. He was sent to the continent by George IV. to paint the leaders in league against Napoleon, and the Waterloo Gallery at Windsor is the result.

**Lawrence,** SIR WILLIAM, 1783–1867. English surgeon. *Hernia*, 1807; *Anatomy and Physiology*, 1819.

**Lawrence,** WILLIAM, b. 1819. Judge in Ohio 1856–64; M.C. 1865–71 and 1873–77; Comptroller U. S. Treasury 1880–85. *Law of Religious Societies* 1873–74; *The Law of Claims Against U. S.* 1875.

**Lawrence,** WILLIAM BEACH, LL.D., 1800–1881. Gov. of R. I. 1851. *Visitation and Search*, 1858; *Commentaire sur les éléments du droit international*, 1868–80; *Disabilities of American Women Married Abroad*, 1871.

**Lawrence University.** Opened 1849 at Appleton, Wis.; under M. E. control. It has 3 courses, 15 teachers, and ab. 400 students.

**Law Reports.** Published judicial decisions. In England they begin with the Year Books of Edward I.

**Laws,** IN ETHICS. Rules of conduct laid down by a rightful authority, commanding within its limits.

**Laws for the Transverse Vibrations of Strings.** (1) When the tension is constant, the time of vibration varies as the length; (2) also as the radius; (3) also, inversely as the square root of the tension, when length and radius are constant; (4) also as the square root of the density, other things being equal.

**Laws of Electrolysis.** See FARADAY'S LAWS.

**Laws of Fusion.** 1. Every substance begins to fuse at a certain temperature, which is invariable for each substance if the pressure be constant. 2. Whatever be the temperature of the source of heat, from the moment fusion begins the temperature of the body ceases to rise and remains constant till the fusion is complete.

**Laws of Reflection.** When radiation is reflected from a regularly reflecting surface, it follows these laws: 1. The angle of reflection is equal to the angle of incidence. 2. The angles of reflection and incidence are in the same plane containing the normal to the surface at the point of incidence.

**Laws of Refraction.** When radiation passes from one transparent medium to another, it is subject to these laws: 1. The angles of refraction and incidence are in the same plane containing the normal to the surface at the point of contact. 2. The ratio of the sines of the angles of incidence and refraction is constant for the same two media. This is called the Law of Sines. This constant is called the Index of Refraction.

**Laws of Solidification.** 1. Every body under the same pressure solidifies at a fixed temperature, which is the same as that of fusion. 2. From the commencement to the end of solidification the temperature of the liquid remains constant.

**Laws of Vibration for Plates.** 1. The number of vibrations per second depends upon the elasticity of the material. 2. In plates alike in other respects the number varies directly as the thickness of the plate. 3. The number varies inversely as the area of the plate.

**Laws of the Vibrations of Rods.** The rod being fixed at one end, it is found that the time of transverse vibration varies as the square of its length and inversely as the dimension in the plane of its motion; also the time of longitudinal vibration varies as the length, independently of the other dimensions.

**Lawson,** CECIL, 1851–1882. English painter.

**Lawson,** JAMES, 1799–1880. Scottish-American author.

**Lawson,** JOHN, d. 1712. Historian of the Carolinas, 1700, repub. 1860.

**Lawson,** SIR WILFRID, b. 1829. Liberal M. P. 1859–65 and since 1868; upholder of local option and other restrictions on the sale of liquor.

**Lawton,** WILLIAM CRANSTON, b. 1853. Teacher in Boston, Phila., and (1895) Brooklyn; writer on the Greek classics.

**Laxatives.** Mild cathartics.

**Lay,** HENRY CHAMPLIN, D.D., LL.D., 1823–1885. Bp. of Ark. 1859, of Easton (Md.) 1869. *Ch. and Nation*, 1885.

**Layamon.** English priest, translator and expander in Semi-Saxon poetry of Wace's *Brut*, ab. 1200.

**Layard,** SIR AUSTEN HENRY, D.C.L., 1817–1894. English explorer of Assyrian remains 1845–47; M.P. 1852; Ambassador to Spain 1869, and to Turkey 1877–80. His excavations bore the splendid results now shown in the British Museum. *Nineveh*, 1849–53.

**Laybach** (near Trieste), CONGRESS OF. Jan.–May, 1821. The allied sovereigns (of Russia, Austria, Prussia, and Naples), resolved to suppress insurrections and to occupy Naples with Austrian troops.

**Laycock,** THOMAS, M.D., 1812–1876. Prof. Edinburgh 1855; medical writer. *Mind and Brain*, 1860.

**Layering.** Method of propagating plants by bending a branch and fastening it in the earth, causing it to develop roots

Propagation by Layers. *a*, tonguing; *b*, ringing.

at the point of insertion, so that it may subsequently live independently.

**Laying a Gun.** Pointing or aiming a gun, by bringing the line connecting the front and rear sights to the point aimed at.

**Lay Reader.** In Ch. of England and P. E. Ch., one licensed by the bishop to conduct such parts of the services as can be rendered by a person not in clerical orders.

**Lazaretto.** Originally, a place where lepers were confined, now, a hospital for infectious disease only.

**Lazarists.** Order founded 1625 by St. Vincent de Paul for teaching and missionary work.

**Lazarus.** Jewish name, contracted from Eleazar. 1. Beggar of the parable. Luke xvi. 19–31. 2. Brother of Martha and Mary, raised by Christ from the dead.

**Lazarus,** EMMA, 1849–1887. American poet, translator of Heine, 1881. *Admetus*, 1871; *Songs of a Semite*, 1882.—Her sister, JOSEPHINE, has pub. *The Spirit of Judaism*, 1895.

**Lazarus,** MORITZ, b. 1824. German writer on philosophy.

**Lazhechnikoff,** IVAN, 1794–1869. Russian historical novelist.

**Lazulite.** $(Fe,Mg)O,Al_2O_3,P_2O_5,H_2O$. Hydrous aluminium phosphate with some magnesium and iron, blue in color, found in small quantities in many parts of the world.

**Lazurite.** See LAPIS-LAZULI.

**Lazzari,** DONATO BRAMANTE, 1444–1514. Italian architect, whose works are mostly in Milan and Rome.

**Lazzaroni.** Neapolitan beggars and workmen, a separate

Sacking of Naples by Lazzaroni.

class till recently, annually electing a chief; prominent in revolutions and civil wars, usually as conservatives.

**Lea,** HENRY CHARLES, LL.D., b. 1825. American historian, whose researches have cast much light on the Dark Ages and are of great sociological value. *Superstition and Force*, 1866; *Sacerdotal Celibacy*, 1867; *Hist. Inquisition*, 3 vols., 1888; *Sacramental Confession and Indulgences*, 1895–96.—His father, ISAAC, LL.D., 1792–1886, was a publisher and naturalist of high repute. *Genus Unio*, 13 vols., 1827–74; *Red Sandstones of Pottsville*, 1852.

**Lead.** Displacement of the brushes in the direction of the motion of a dynamo-electric machine from their theoretical position; viz., on a line perpendicular to that joining the poles of the field magnet. A line joining the points of contact of the two brushes is called the diameter of commutation.

**Lead.** See LODE and LAP.

**Lead** (PLUMBUM). Pb. At.wt. 206.95, sp.gr. 11.35, sp.ht. .03–.04, mpt. 326° C., valence II. Known to the ancients. Bluish-white, soft metal, burning in the air to litharge, PbO. In contact with moist air it is changed to $Pb(OH)_2$(?). Water containing much carbon dioxide acts upon lead to form lead carbonate. Not acted on by sulphuric and hydrochloric acids, but readily soluble in nitric acid. Many of the lead compounds are isomorphous with those of barium.

**Lead,** METALLURGY OF. At ordinary temperatures lead resists very strongly most chemical corroding agencies. Commercial lead is often almost chemically pure. In price ($60 per ton), as well as in its varied uses, it ranks second to iron. It has been known from early antiquity; the Egyptians used it for glazing pottery, and it was mined on a large scale by the Greeks and Romans. The U. S. now leads in this, producing, in 1895, 143,000 metric tons, ab. one-third of the total production. Most of the output of the U. S. comes from Mo., Ill., and the more western States, Montana, Col., Utah, Nevada, Idaho, New Mexico, Arizona, Cal. Throughout the West it is virtually a by-product from the extraction of silver, almost all the silver occurring in lead ore.

In nature, it occurs as Galena, Cerussite, Anglesite, and in numerous other combinations. Galena is the most important ore. Lead ores occur in deposits of every variety and form and are often associated with limestone and with ores of zinc.

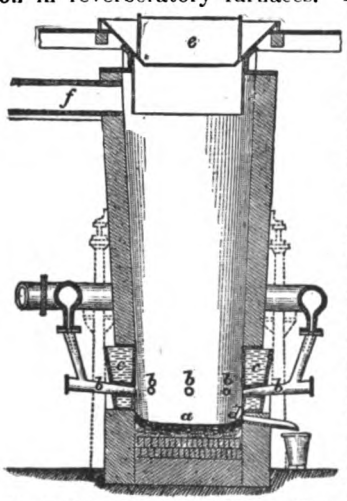
Lead ores are easily reduced by several methods. Ores free from sulphur, arsenic, antimony, selenium or tellurium, are simply mixed with carbon as a reducing agent (ground coal, coke, charcoal), and a suitable flux to unite with the gangue of the ore, to form a fusible slag, and then smelted down on a hearth or in a reverberatory- or a shaft-furnace. The reduction takes place at a red heat, and the metal is collected without difficulty. Ores containing sulphur, etc., must be treated differently. The simplest method is to melt them in contact with scrap-iron. Iron has more affinity for sulphur, etc., than lead has, and therefore forms iron sulphide and sets the lead free. This operation is performed on the hearth of a reverberatory furnace, and is very efficient, but depends for its practicability on the value of scrap-iron at the works. Another method for reducing these ores is to first drive off all the sulphur, etc., by roasting, *i.e.*, a gentle heating to redness in a current of air. This operation converts the ore mostly into lead oxide, which is further treated by any of the methods for reducing oxide ores. Still another process for reducing the sulphur ores, and the one in largest use, is a partial roasting, followed by a reaction of the oxidized ore upon the remaining non-oxidized ore. On roasting, lead sulphide passes mostly to oxide, but partly to sulphate, the reactions being

$$PbS+O_3=PbO+SO_2$$
$$PbS+O_4=PbSO_4.$$

If, when part of the ore is thus oxidized, the supply of air is cut off, the oxidized part well mixed with the unoxidized part, and the heat then raised higher than before, the oxygen in the oxidized ore reacts on the sulphur in the unoxidized portion, so as to set all the lead free, according to the reactions,

$$2PbO+PbS=3Pb+SO_2$$
$$PbSO_4+PbS=2Pb+2SO_2.$$

This is called the roasting and reaction process, and is carried on in reverberatory furnaces. The charge is about a ton of crushed ore at a time: it is roasted with careful stirring for two hours, then the doors are closed and a strong heat employed for about an hour, the lead set free collecting in a depression in the hearth, with the slag floating on top of it.




Vertical Section of the Pilz Blast-Furnace for smelting Lead:

*a*, hearth; *b*, tuyeres, by which air-blast enters; *c*, water-jacket; *d*, tap-hole; *e*, cover; *f*, flue.

The result of these reduction processes is raw or impure lead, which must be refined. The impurities frequently present are arsenic, antimony, copper, zinc, and bismuth, also any silver or gold which were in the ore. In any method of refining, the precious metals and bismuth remain in the lead, so that their separation involves a different set of processes, described under the METALLURGY OF SILVER (q.v.). The other metals are usually removed by oxidation in a softening furnace. The impure lead is melted on the hearth of a reverberatory furnace, and a strong current of air led over it. Copper and zinc are mostly removed in the skimmings immediately after melting, as the purer lead liquates away from the less fusible alloy of lead with zinc and copper, which, being lighter, floats on the purer lead as a thick, mushy scum, and is removed by perforated ladles. After this the arsenic and antimony oxidize to arsenate and antimonate of lead and flow off as slag. If iron, nickel, or much zinc is present, they are best removed by the action of steam, which may be introduced either directly by a pipe, as superheated steam, or indirectly by stirring the metal with a pole of green wood, an operation called poling.

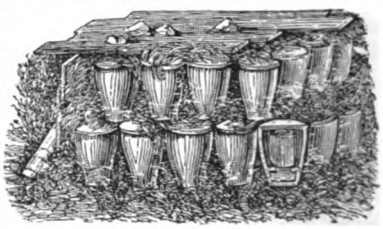
Lead is largely used by itself for roofing, water-pipes, lining tanks for chemical purposes, acid chambers, etc. The most important alloys are Type Metal (see ANTIMONY), Shot Metal (see ARSENIC), Tinman's Solder, containing 30 to 60 per cent of tin, Pewter, and Bearing Metal (see ANTIMONY). Baths of lead, or of alloys of lead and tin, are frequently used for tempering steel instruments. Sheet-iron coated with an alloy of lead (70 to 80 parts) and tin (20 to 30 parts) is called Terne plate, and is in large use for roofing purposes.

**Lead,** STRENGTH OF. The tensile strength of lead pipe is ab. 1,600 lbs. per sq. inch; and the compressive strength of lead in small blocks is ab. 3,000 lbs. per sq. inch.

**Lead Acetate.** See ACETATE OF LEAD.

**Lead Bromide.** $PbBr_2$. White, crystalline powder or lustrous needles; soluble in hot water; made by treating lead oxide, PbO, with hydrobromic acid.

**Lead Carbonate.** $PbCO_3$. Occurring in nature as cerussite; white, insoluble powder, made in the laboratory by treating the nitrate with ammonium carbonate. Basic lead carbonate is made in large quantities. It is used for paints and is white lead of commerce. According to the Dutch method, it is made by exposing buckles of lead or spirals to the action of air, acetic acid, and carbon dioxide. The French method consists in passing carbon dioxide into basic lead acetate. The English method consists in passing carbon dioxide over moistened litharge containing ab. one per cent lead acetate. White lead contains varying proportions of lead carbonate and lead hydroxide.



Dutch Method for White Lead.

**Lead Chloride.** $PbCl_2$. Found in nature in small quantities. See COTUNNITE. White needle-shaped crystals, insoluble in cold water, soluble in hot water; made by treating a soluble lead salt with a soluble chloride.

**Lead Chromate.** $PbCrO_4$. Occurring in nature; fine yellow powder, used as a coloring matter, chrome yellow. It is made by treating a lead salt with a chromate, is a good oxidizing agent, used in the laboratory for that purpose, and is soluble in caustic alkalies.

**Lead Cyanide.** $Pb(CN)_2$. White powder, obtained by precipitating a soluble lead salt with a soluble cyanide.

**Lead Dioxide,** or PEROXIDE. $PbO_2$. Dark brown powder, made by treating minium with dilute nitric acid: soluble in caustic potash. With hydrochloric acid it frees chlorine.

**Lead Fluoride.** $PbFl_2$. White crystalline or amorphous powder, insoluble in water; made by treating the carbonate with hydrofluoric acid.

**Lead Hydroxide.** Varies in composition. The compound $Pb(OH)_2$ is unknown. It is made by adding a hydroxide to a lead salt; the compound thus formed is usually $Pb(OH)_2$. PbO or $Pb(OH)_2.2PbO$.

**Leading Beam.** Beam temporarily laid as a guide for the permanent ones.

**Leading Letter.** That in reference to which the terms of a literal expression are arranged: in a binomial, as $(a+x)$, the first is the leading letter.

**Leading Motive,** or LEITMOTIV. In musical composition, particularly dramatic, brief phrase, distinguished strongly by intervallic, rhythmic, or harmonic characteristics, which the composer associates with the personages, passions, or other agencies of his drama, and which form the thematic material of his musical structure, and are developed along with the story; chiefly exemplified in Wagner's later works.

**Leading Question.** One which shows the witness the answer desired; not allowed on direct, but permitted on cross-examination.

**Lead Iodide.** $PbI_2$. Beautiful yellow crystalline compound, made by adding potassium iodide to a solution of a lead salt. It unites with potassium iodide, forming double salts, as $PbI_2.2KI$.

**Lead Nitrate.** $Pb(NO_3)_2$. White crystals, formed by dissolving lead in nitric acid. If heated, it decomposes readily, yielding lead oxide.

**Lead Nitrite.** $Pb(NO_2)_2.H_2O$. Yellow leaflets or long columns, made by treating a solution of silver nitrite with a solution of lead chloride.

**Lead Oxide.** PbO. Yellow powder, which, if heated, becomes reddish; known as litharge; made by heating lead nitrate; also formed in the process of extracting silver from its ores; used in the manufacture of flint-glass and of lead salts, in glass and porcelain painting. Lead oxide, if kept at a low red heat for some time, is converted into red lead or minium, $Pb_3O_4$, used as a pigment.

**Lead Peroxide.** See LEAD DIOXIDE.

**Lead Phosphate.** $Pb_3(PO_4)_2$. White powder, obtained by treating a solution of lead acetate with sodium hydrogen phosphate. On heating it is converted into lead pyrophosphate.

**Lead Plant.** *Amorpha canescens*. Low shrub of the Bean family, native of the central U. S., supposed to indicate outcrops of lead ore.

**Lead Poisoning.** Diseased condition due to the absorption of lead or its salts into the system. Printers, plumbers, painters, and workers in white lead factories are the ones most commonly attacked, but the use of water, food, etc., containing lead often leads to it. The most prominent symptoms are colic, constipation, paralysis of the muscles which move the hand backward, allowing the hand to hang flaccid, and a blue line along the margins of the gums. Removal of the exciting cause, extended employment of potassium iodide and electricity to the paralyzed muscles, usually effect a cure.

**Lead Sesquioxide.** $Pb_2O_3$. Reddish-yellow powder, made by adding caustic soda to lead acetate and treating the solution with sodium hypochlorite.

**Lead Suboxide.** $Pb_2O$. Black powder, formed when lead is exposed to the air.

**Lead Sulphate.** $PbSO_4$. Occurring in nature as ANGLESITE (q.v.). White, insoluble powder, made by adding sulphuric acid or a sulphate to a lead salt; soluble in ammonium tartrate.

**Lead Sulphide.** PbS. Occurring in nature as GALENA (q.v.). As made in the laboratory, by passing hydrogen sulphide into a solution of a lead salt, it is a black precipitate, soluble in concentrated hydrochloric acid.

**Leadville.** City of Lake co., Col., in the upper valley of the Arkansas River, between two high mountain ranges, at an

Leadville, in its Early Days.

elevation of 10,200 ft.; founded 1859 as a camp for gold-mining; abandoned 1864. It owes its revival to large and rich deposits of silver-lead ore, discovered 1877. Pop., 1890, 11,212.

**Leadwort.** Blue-flowered herbs of the genus *Plumbago*, natural family *Plumbaginaceæ*, natives of warm regions.

**Leaf.** Lateral outgrowth from a stem and principal organ for the assimilation of gases from the atmosphere.

**Leaf-Cup.** Plants of the genus *Polymnia*; large, coarse herbs of the Composite family, with dilated leaf bases; natives of s. e. N. America.

**Leaf-Hoppers.** Numerous species of insects nearly alike, ab. $\frac{1}{10}$ inch long, and of greenish color. They feed on sap, puncturing the leaves and making them look as if scalded. They can be destroyed by using kerosene emulsion. The most important species are named after their favorite plants, apple, barley, clover, grape, rose, etc.; but a species does not confine itself to a single kind of plant.

**Leaflets.** Divisions of a compound leaf, as in the Locust or Buckeye.

**Leaf-Stalk.** See PETIOLE.

**heague.** Three geographical miles: $\frac{1}{20}$ of a degree.

**League,** CATHOLIC. See HOLY LEAGUE.

**Leah.** Daughter of Laban, wife of the patriarch Jacob, and ancestress of the tribes of Reuben, Simeon, Levi, Judah, Issachar and Zebulun.

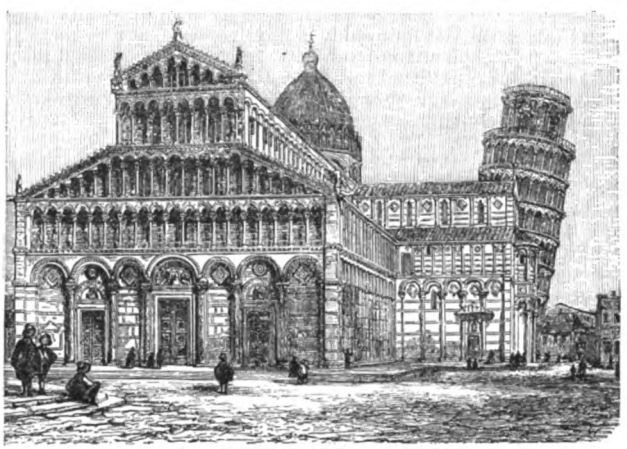
**Leake,** SIR JOHN, 1656–1720. English admiral, prominent in wars with Spain and France; knighted 1702 for his conquest of Newfoundland.

**Leake,** WILLIAM MARTIN, 1777–1860. English officer, author of sundry valuable works on Greece, its geography, and its coins. *Tour in Asia Minor*, 1824.

**Leander.** Youth of Abydas who swam the Hellespont nightly to visit Hero, priestess of Aphrodite, at Sestos. Hero threw herself into the sea on finding his corpse on the shore.

**Leang Dynasty.** See HOW LEANG.

**Leaning Towers.** Many towers lean from the perpendicular because their foundations have settled. The most celebrated one, that of the Pisa Cathedral, overhangs 13 ft. in a



Leaning Tower of Pisa Cathedral.

total height of 175. Of the two adjacent towers in Bologna, one leans 10 ft. in 160. Others are at Saragossa, Este, Venice, Ferrara, Padua, and Neviansk (Siberia).

**Leap Frog.** Boys' game in which a number of persons stand with their heads bent and hands resting on their thighs, while one of the players runs and leaps over each of them, placing his hands on their backs; called in France Saut de Mouton or the Sheep's Leap. The traditions of the game run back to classical antiquity. It is common in Corea and Japan, in the latter as Zobi Roshi, "leaping over."

**Leap Year.** See CALENDARS, GREGORIAN and JULIAN.

**Lear,** EDWARD, 1813–1888. English painter, traveler and author. *Rome*, 1842; *Italy*, 1846; *Greece and Albania*, 1851; *Calabria*, 1852; *Corsica*, 1869. More widely known is his *Book of Nonsense*, 1861.

**Lease.** Conveyance of any lands or tenements, usually in consideration of rent, made for life, for year, or at will, but always for a less time than the lessor has in the property. See LANDLORD AND TENANT.

**Lease and Release.** Species of conveyance much used in England, proceeding on the same theory as BARGAIN AND SALE (q.v.).

**Least Common Multiple.** Smallest number which exactly contains each of two or more quantities. It comprises all the factors of each quantity in turn and no other factor. It is found (1) by obtaining the product of all such factors or (2), for any two quantities, by dividing their product by their greatest common divisor.

**Least Squares.** Method for the adjustment of observations so as to eliminate the effect of accidental errors as far as possible. It was announced 1805 by Legendre, and has since been extensively used in astronomy and surveying. The principle upon which it is founded is that the most probable values of observed quantities are those that render the sum of the squares of the residual errors a minimum. Residual errors are the remainders on subtracting from each observation the arithmetical mean of all the observations.

**Least Work.** Principle in mechanics, that the forces generated to resist applied forces are such that the work done

by them is a minimum; advantageous in finding the stresses in structures which have too many members to be investigated by pure statics.

**Leather.** Skins of animals, in which the agglutination of the fibers after drying is prevented by some method or other. It resists putrefaction, and is supple and tough. Skins consist of four layers: the epidermis; then the malpighian layer, containing the nerves, fine blood-vessels, and perspiration glands, the hair having its roots here as well as below; the third is the corium, of fibrous structure, of which leather is made; and the inner layer, the fat bearing tissue. The hair is removed by soaking in lime water or sweating and then scraping with knives; the fatty tissue is also scraped off. There are three varieties of leather, tanned, tawed, and oil tawed. In the first the skins, prepared as above, are subjected to a water solution of tannic acid, for a greater or less time, in proportion to their thickness, and the gelatine in them combines with the acid, forming leather. That used for the soles of shoes is made from the hides of cattle; the tannic acid is extracted from hemlock and oak bark: it requires 5 months for its production. Leather for the uppers of shoes is made from calf-skins tanned with oak bark, requiring 8 weeks. It is blacked with lamp-black and fish oil on the flesh side.

Russia leather is made from calf or sheep skins, tanned with bark of the willow, fir, or birch; it is impregnated with oil of birch and dyed on the hair side; it requires 6 weeks.

Morocco leather is made from goat or kid skins, tanned with sumac, dyed with aniline colors on the hair side, requiring 3 days. Imitation morocco is made from split calf or sheep skins.

Lacquered leather is made from split ox hides, coated with a black varnish at 50° C.

Danish glove leather is made from goat, kid, and lamb skins, tanned with willow bark.

Tawed leather is made from thin skins, sheep or goat, cleansed as in the tanning process, and then treated with a water solution of alum and salt, the aluminium sulphate combining with the gelatine of the skins; it requires 2 to 3 weeks; the white leather for boot linings is thus made.

Glove leather is made from skins of goats or lambs, tawed with a mixture of wheat flour, yolks of eggs, alum, salt and water, and dyed on the hair side.

Oil-tawed or wash leather is made from ox, deer, sheep, or calf skins, cleansed as in the other processes, fish oil being rubbed and stamped in on the hair side, which combines with the skin. The uncombined oil is removed by a solution of potassium hydroxide.

Genesis xxi. 14 gives the first historical record of leather, but Chinese specimens 3,000 years old are known. Babylonian leather was long celebrated, while, in the 1st century, the Romans and Hungarians were leaders in its manufacture. The oldest rock-dwellers of Arizona wore leather sandal thongs, and Columbus found tanned leather in the W. Indies. In 1895 the U. S. imported $13,819,038 worth of leather and leather goods, and exported $15,614,407 worth.

**Leather,** STRENGTH OF. The average ultimate strength of leather belts is 3,000 lbs. per sq. inch of cross-section.

**Leather-back Turtle.** See SPARGIDÆ.

**Leather-Flower.** *Clematis viorna.* Climbing vine of the natural family *Ranunculaceæ*, native of the e. U. S., bearing flowers with remarkably thickened sepals.

**Leather-Leaf.** *Cassandra calyculata.* White-flowered shrub of the Heath family, growing in bogs in the cooler parts of the n. hemisphere.

**Leatherwood.** *Dirca palustris.* Small tree of the natural family *Thymeleaceæ*, native of n. e. N. America, bearing a tough fibrous bark; known as Moosewood and Wicopy.

**Leathes,** STANLEY, D.D., b. 1830. Prof. in King's Coll., London, 1863; O. T. reviser. *Religion of the Christ*, 1874.

**Leaven.** Sour dough added to fresh dough to hasten fermentation, which develops carbonic acid gas and makes the bread spongy; ancient substitute for yeast.

**Leavenworth.** Capital of L. co., Kansas; on the Missouri; founded 1854; prominent in the Freesoil and Border Ruffian contests. Fort L., an important military post, is 2 m. n. Pop., 1890, 19,768.

**Leave of Absence.** Permission by which an officer is authorized to absent himself from his post or duty. A soldier under like circumstances is said to be furloughed. Post commanders may grant leaves for seven days at one time or during any one month, a department commander for one month, and the commanding general for two months. Longer leaves require the action of the War Department. Officers are entitled to one month's leave annually.

**Leavitt,** ERASMUS DARWIN, b. 1836. Mechanical engineer. Consulting engineer of the Calumet and Hecla Copper Mining Co., Mich., since 1874.

**Lebanon.** Syrian double mountain-range, running n. and s. Its southern peak of Hermon and its cedar forests figure

View of the Lebanon Range.

constantly in O. T. Every available spot is cultivated up to 6,000 ft. with fig, olive, and mulberry trees.

**Lebanon.** Capital of L. co., Pa.; 25 m. e. of Harrisburg; founded 1740, chartered 1821. The chief industries are manufactures of iron. Pop., 1890, 14,664.

**Lebanon Valley College.** At Annville, Pa., 4 m. w. of Lebanon; opened 1866 by United Brethren. It is coeducational, and has two courses, classical and scientific, besides departments of music and art.

**Le Bas,** PHILIPPE, 1794–1861. Prof. Paris 1829; writer on Greek inscriptions and archæology.

**Lebeau,** JEAN LOUIS JOSEPH, 1794–1865. Belgian journalist and Minister of State.

**Leber,** THEODOR, b. 1840. Prof. Göttingen 1871, Heidelberg 1890; writer on ophthalmology.

**Le Blanc Process.** See SODIUM CARBONATE.

**Le Bœuf,** EDMOND, 1809–1888. French officer, prominent in the Crimean, Italian, and Franco-German wars; Marshal 1870.

**Le Brun,** CHARLES, 1619–1690. French painter, favored by Louis XIV. Though his name is much quoted, his art was weak.

**Lebrun,** CHARLES FRANÇOIS, 1739–1824. French Deputy 1789; Pres. Council of 500 1796; 3d Consul 1799; Treasurer under Napoleon; Duke of Piacenza; Gov. of Holland 1810–14; Peer 1819.

**Le Brun,** MARIE LOUISE ELIZABETH (VIGEE), 1755–1842. French portrait painter, whose work has very graceful qualities.

**Le Brun,** PIERRE ANTOINE, 1785–1873. French poet and dramatist. Academician 1828.

**Le Brun,** PONCE DENIS ECOUCHARD, 1729–1807. French lyric poet.

**Lechevalier,** JEAN BAPTISTE, 1752–1836. French explorer of Homeric sites, noted for eccentricity and pretentiousness; librarian in Paris from 1805. *La Troade*, 1794; *La Propontide*, 1800; *Ulysse-Homère*, 1829.

**Lechler,** GOTTHARD VICTOR, 1811–1888. Prof. Leipzig 1858. *Apostolic Times*, 1851, tr. 1886; *Wiclif*, 1873, tr. 1878.

**Lecithin.** $C_{44}H_{90}N.PO_9$. Organic substance containing phosphorus, found in growing cells of certain plants.

**Lecky,** WILLIAM EDWARD HARTPOLE, b. 1838. English historian, of *Rationalism*, 1865, of *European Morals*, 1869, and of *England in the 18th Century*, 8 vols., 1878–90. The two former are works of great importance, which have exerted wide influence, and are highly esteemed in Germany. *Democracy and Liberty*, 1896.

**Leclaire,** EDME JEAN, 1801–1872. French master-painter, who introduced the co-operative or profit-sharing method with his workmen 1842.

**Leclerc,** JEAN, or JOHANNES CLERICUS, 1657–1736. Swiss divine of liberal views, prof. Amsterdam 1684; prolific writer; editor of several Bibliothèques.

**Leclerc,** JOSEPH VICTOR, 1789–1865. French translator of Cicero, 1821–25.

**Leclerc,** VICTOR EMMANUEL, 1772–1802. French general, husband of Pauline Bonaparte 1797; conqueror of St. Domingo.

**Leclercq,** MICHEL THÉODORE, 1777–1851. French dramatist and novelist.

**Lecocq,** ALEXANDRE CHARLES, b. 1832. French composer of opéras bouffes, Offenbach's most successful follower. His

most popular works are *La fille de Madame Angot*, 1874, *Giroflé-Girofla*, 1874, and *Le petit Duc*, 1878.

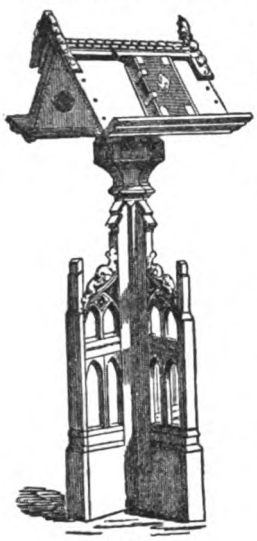
**Lecomte,** LOUIS. ab. 1655–1729. French Jesuit, missionary in China 1688–91. *La Chine*, 1696–1701.

**Le Conte,** JOHN EATON, 1784–1860. American naturalist, author of sundry monographs.—His brother, LEWIS, M.D., 1782–1838, was noted chiefly as a botanist.—His son, JOHN, M.D., LL.D., 1818–1891, was Prof. Franklin Coll. 1846–55, S. C. Coll. 1856, and Univ. Cal. from 1869. He wrote much on the physical sciences.—His brother, JOSEPH, M.D., LL.D., b. 1823, became prof. S. C. Coll. 1857, and Univ. Cal. 1869. His chief work has been in dynamic geology, especially orography, or mountain structure. *Geology*, 1878–84.—His cousin, JOHN LAWRENCE, M.D., 1825–1883, was eminent as a naturalist.

**Leconte de Lisle,** CHARLES MARIE RENE, b. 1818 in I. Réunion. French poet of high rank and great influence, Academician 1886. *Poemes Antiques*, 1853, *barbares*, 1862, *tragiques*, 1884.

**Lecouvreur,** ADRIENNE, 1690–1730. French actress, prominent in the Théâtre Français from 1717; subject of a play by Scribe and Legouvé, 1849.

**Lectern.** Church reading desk, used in primitive Christian times, and still in modern use for the Scripture lessons.



Lectern.

**Lectionary.** Table of O. T. and N. T. lessons appointed to be read on Sundays and other days in the Greek, Roman, Anglican, or Lutheran Churches.

**Lector.** Minor Ch. officer, appointed till ab. 500 to read the lessons in the service.

**Leda.** Wife of Tyndareus, king of Sparta. Visited by Jupiter in form of a swan, she became the mother of Castor and Pollux.

**Ledebour,** KARL FRIEDRICH VON, 1785–1851. Prof. Dorpat. *Flora altaica*, 1829–34: *Icones plantarum*, 1829–34; *Flora rossica*, 1842–53.

**Lederer,** JOHANN. German traveler in Va. and N. C. 1669–70. His book was tr. 1672.

**Ledesma Buitrago,** ALONSO DE, 1552–1623. Spanish poet.

**Ledge.** Vein or lode; miner's term.

**Ledochowski,** MIECISLAS HALKA, COUNT DE, b. 1822. Papal nuncio in Spain, Portugal, Brazil and Chili; Abp. of Posen 1866; imprisoned 1874–76 for resisting the Falk laws: Cardinal 1875; Prefect of the Propaganda 1892.

**Ledru-Rollin,** ALEXANDRE AUGUSTE, 1807–1874. Parisian advocate and journalist; Deputy 1841; prominent as a radical; in exile 1849–70. *Works*, 1879.

**Ledyard,** JOHN, 1751–1789. American traveler, with Cook on his last voyage, of which he pub. an account 1783. After many disappointments and hardships, he was sent from England to Africa, only to die at Cairo.—His relative, WILLIAM, 1750–1781, commanded a fort near New London, Conn., and was murdered by the British after its surrender.

**Lee.** That part of the hemisphere toward which the wind is blowing.

**Lee,** ANN, 1736–1784. English reorganizer of Shakerism. She came to America 1774, and founded the settlement at New Lebanon, N.Y., 1780.

**Lee,** CHARLES, 1731–1782. English officer, who came to America 1773, purchased an estate in Va. 1775, and in July was made Major-gen. in the Continental army, hoping to supersede Washington. His character and abilities were greatly overrated, and the appointment proved most unfortunate. His misconduct caused the loss of Fort Washington Nov. 16, 1776. While a prisoner, Dec. 1776–May 1778, he came to terms with the enemy, and drew up for them a plan of campaign. At Monmouth, June 28, he asked and received command of the van, and by disobedience to orders invited defeat, exciting Washington's just anger. For this he was court-martialed, suspended for a year, and ultimately dismissed for insulting Congress. The proofs of his treason were discovered long after.

**Lee,** FREDERICK GEORGE. D.D., D.C.L., b. 1832. Vicar of Lambeth 1867. *Prayer for the Departed*, 1874; *Glimpses of the Supernatural*, 1875.

**Lee,** FREDERICK RICHARD, 1798–1879. English landscape painter, R.A. 1838.

**Lee,** HARRIET, 1756–1851, and her sister, SOPHIA, 1750–1824. English novelists and dramatists. Their chief work, *Canterbury Tales*, 5 vols., 1797–1805, was long popular. Harriet wrote 8 of the 10 tales, including the most important, drawn on by Byron for *Werner*.

**Lee,** HENRY ("LIGHT HORSE HARRY"), 1756–1818. Officer of the Continental army, eminent for gallantry in Pa. 1778–79, and in S.C. 1781, especially at Eutaw Springs, Sept. 8: Gov. of Va. 1792–95; general, to suppress the Whisky insurrection in w. Pa. 1794; M.C. 1799–1801; eulogist of Washington, and author of the phrase, "First in war," etc.; wounded by a mob in Baltimore 1812; second cousin of the Stratford Lees, and father of Gen. Robert E. Lee. *War in the Southern Department*, 1812. —His brother, CHARLES, 1758–1815, was U. S. Attorney-gen. 1795–1801.—His grandson, SAMUEL PHILLIPS, U.S.N., b. 1812, served through the Civil War, and became rear-admiral 1870.

**Lee,** JESSE, 1758–1816. Virginian, "Apostle of Methodism in New England."

**Lee,** LUTHER, 1800–1889. Ed. *True Wesleyan*, 1842–52; prof. Adrian Coll., Mich., 1864–67. *Universalism*, 1836; *Slavery*, 1855.

**Lee,** NATHANIEL, 1658–1691. English dramatist.

**Lee,** RICHARD, ab. 1590–ab. 1661. Founder of a famous house in Va. ab. 1630; long sec. to Gov. Berkeley; royalist.—His grandson, THOMAS, d. 1750, as Gov. of Va., built Stratford House, Westmoreland co., and was father of an illustrious family.—His second son, THOMAS LUDWELL, ab. 1730–1777, was a patriot and judge.—The third, RICHARD HENRY, 1732–1794, signed and urged the Declaration of Independence, being in the Continental Congress 1774–79, its pres. 1784–85, and U. S. Senator 1789–92.—The fourth, FRANCIS LIGHTFOOT, 1734–1797, was also in Congress 1775–79 and a signer of the Declaration.—The fifth, WILLIAM, 1737–1795, was agent for Va. in London, sheriff of Middlesex 1773, and agent or commissioner of the U. S. in Europe 1777–79. —The sixth, ARTHUR, 1740–1792, was agent of Mass. in London 1770; diplomatic agent in Paris 1776–79 with Franklin and Deane, with whom he quarreled; delegate to Congress 1782–85; and on the Treasury Board 1784–89.

**Lee,** ROBERT, D.D., 1804–1868. Prof. Edinburgh 1846; reformer of Presbyterian services in a churchly direction; ed. of a reference Bible, 1854, and *Prayers*, 1857. *The Family*, 1863; *Reform of the Ch.*, 1864.

**Lee,** ROBERT EDWARD, 1807–1870. Chief general of the Confederate States; son of Gen. Henry; officer U.S.A. 1829–61; distinguished in the war with Mexico; supt. Military Academy 1852–55; Col. 1861. Accepting the doctrine of State rights he reluctantly resigned his commission April 1861, took command of Va. troops, and in May became Gen. C.S.A. After brief service in W. Va. and S. C., he returned to Richmond, which he protected from McClelland's attacks. He defeated Burnside at Fredericksburg, and Hooker at Chancellorsville, but was checked by Meade at Gettysburg, July 1863. He withstood Grant throughout 1864, but was forced to surrender at Appomattox, April 11, 1865. His last years were spent as pres. of

Gen. Robert E. Lee.

Washington Coll. (now Washington and Lee Univ.), Lexington, Va. His character commanded universal respect; in ability he ranks with the best of recent military leaders. His estate of Arlington, opposite Washington, is now a national cemetery.—Of his sons, GEORGE WASHINGTON CUSTIS, LL.D., b. 1832, served in Va. through the war, became Major-gen. C.S.A. 1864, prof. Va. Military Institute 1865, and pres. Washington Coll. 1871.—WILLIAM HENRY FITZHUGH, 1837–1891, became Capt. C.S.A. 1861, Col. and Brig.-gen. 1862, Major-gen. 1864, and was

M.C. 1887-91.—Their cousin, FITZHUGH, b. 1835, also served through the war, from 1863, as Major-gen. C.S.A. He was Gov. of Va. 1885-88, and was sent to Cuba as U. S. Consul-gen. 1896.

**Lee,** SAMUEL, D.D., 1783-1852. Prof. Cambridge 1819; ed. Syriac and other oriental Bibles; tr. Ibn Batuta's *Travels*, 1833, Book of Job, 1837, and *Eusebius' Theophania*, 1843. *Hebrew Grammar*, 1827; *Hebrew Lexicon*, 1840: *Prophecy*, 1849.

**Lee,** WILLIAM LITTLE, 1821-1857. Chief-justice and Chancellor of Hawaii from 1848; negotiator of a treaty with the U. S.

**Leech.** See HIRNDINEA and GNATHOBDELLIDÆ.

**Leech,** JOHN, 1817-1864. English artist, celebrated for his illustrations in *Punch* and in many humorous books.

**Leech Eater** (HOPLOPTERUS). Plover of the Nile, supposed to eat the leeches, etc., that have fastened to the lips of crocodiles. It has a spur on the bend of the wing. The real crocodile bird is also a Plover of the genus *Pluvianus*.

Leech Eater.

**Leeches.** Borders or edges of a sail.

**Leeds.** City of Yorkshire, on the Aire; most important seat of manufactures of woolen goods in Great Britain; chartered ab. 1300; taken after a hard fight by Fairfax, Jan. 23, 1643; seat of Yorkshire Coll., founded 1874. Pop., 1891, 367,506.

**Leeds,** THOMAS OSBORNE, DUKE OF, 1631-1712. M.P. 1661; Baron Danby 1673; Lord High Treasurer 1674; impeached 1678, and in prison till 1683; Marquis and Pres. of Council 1688; Duke 1694; again impeached, for bribery, 1695.

**Leek.** *Alliurn porrum.* Esculent herb of the Lily family, native of the Old World; widely cultivated. The wild Leek of e. N. America is *A. tricoccum.*

**Leesburg** (VA.), BATTLE OF. See BALL'S BLUFF.

**Leeser,** ISAAC, 1806-1868. Rabbi in Phila. from 1829; writer on Jewish subjects.

**Leeuwenhock,** ANTON VAN, 1652-1723. Dutch botanist, eminent in microscopy, whereby he made several important anatomical discoveries. *Arcana naturæ*, 1695; *Opera omnia*, 1715-22, partly tr. 1798-1801.

**Leeward Islands.** Antigua and others in W. Indies, held by Great Britain. Area 700 sq. m.; pop., 1891, 127,723.

**Leeway.** Lateral movement or drift of a ship to leeward of her course.

**Lefebvre,** FRANCOIS JOSEPH, DUKE OF DANTZIC, 1755-1820. French general 1794, Marshal 1804; distinguished especially at the siege of Dantzic, 1807, and in Spain; commander of the guard 1812, and of the left wing 1814; Peer 1814 and 1819.

**Lefebvre,** JULES JOSEPH, b. 1834. French painter.

**Lefebvre-Desnouettes,** CHARLES COMTE DE, 1773-1822. French general 1806; active in Napoleon's later wars; in exile from 1815.

**Lefèvre,** or **Faber,** TANNEGUI, 1615-1672. Prof. Saumur; ed. Latin and Greek classics; tr. Lokman's *Fables*, 1673.

**Leffler,** ANNA CARLOTTA, 1849-1892. Swedish novelist and dramatist. She became Mrs. Edgreen 1870, and in 1890 Duchess Caianello of Naples.

**Lefort,** FRANÇOIS JACOB, 1656-1699. Swiss officer, in Russia from 1675; Minister of Peter the Great; Commander-in-chief 1694, having reorganized the army and created a navy.

**Lefuel,** HECTOR MARTIN, 1810-1880. French architect.

**Leg.** Lower limb, between the knee and the ankle, consisting of two bones, the tibia and the fibula, the former the larger bone, with muscles, nerves, and blood-vessels.

**Legacy.** Gift by will of personal property. It may be of a specific thing or of a portion of the estate; if specific it is subject to ademption, or extinguishment in case the thing is disposed of by the testator or destroyed: if general, it is subject to abatement if the assets are insufficient to pay all. The time and manner of payment are generally regulated by statute.

**Le Gallienne,** RICHARD, b. 1866. English poet and critic. *Religion of a Literary Man*, 1894; *Retrospective Reviews*, 1896.

**Legal Tender.** Money which a creditor is by law bound to accept at its face value when offered to him in payment of a debt; in the U. S., especially the greenbacks or national government notes issued during the civil war.

**Legaré,** HUGH SWINTON, 1797-1843. M.C. from S. C. 1837-39; U. S. Attorney-gen. 1841.

**Legaspi,** MIGUEL LOPEZ DE, 1524-1572. Spanish conqueror of the Philippine Islands 1565, and of Luzon 1570; founder of Manila 1571.

**Legate.** Ecclesiastic representing the Pope; when *a latere*, he sometimes exercised full papal authority in a country.

**Legation.** Public envoy and his suite.

**Legend.** Mythical or partly true tale, religious or secular, handed down for a time by tradition, and imperfectly susceptible of verification or disproof; often miraculous; commonly to be judged chiefly or alone by internal evidence.

**Legendre,** ADRIEN MARIE, 1752-1833. French mathematician, prof. in the Paris Military School 1777, and at the Normal 1795. *Geometry*, 1794, tr. 1824; *Theory of Numbers*, 1798; *Integral Calculus*, 1811-26; *Elliptical Functions*, 1825-26.

**Leger,** PAUL LOUIS, b. 1843. Prof. Coll. de France 1885; author of books on the Slavic races. *Hist. Austria-Hungary*, 1878; *Russian Literature*, 1892.

**Legge,** JAMES, D.D., LL.D., b. 1815. Scottish missionary to China 1839-73; prof. Oxford 1875. *Chinese Classics*, 8 vols., 1861-71.

**Leggett,** WILLIAM, 1802-1839. American author and editor.

**Leghorn.** Chief city and seaport of Tuscany, Italy, and its chief commercial port. Known from ab. 860; from 1421 long held by Florence; formerly noted for its manufacture of straw hats. Pop., 1891, 104,000.

The Port of Leghorn.

**Legion,** LOYAL. See LOYAL LEGION.

**Legion,** ROMAN. Division of the army containing originally 3,000 men, afterward 4,000 to 5,000, then 6,000. It consisted of 10 cohorts, each of 3 maniples (companies) of 2 centuries each. It was commanded by 6 tribunes, and 300 knights (cavalry) were attached to it. Its constitution, as well as its numbers, underwent various changes.

**Legion,** THEBAN. Mythical body of 6,666 Christian soldiers, said to have been raised in Egypt, twice decimated, and then massacred at Agaunum or St. Maurice in Switzerland, ab. 305, for refusing the heathen oaths of allegiance.

**Legion,** THUNDERING. In the legend, Christian troops whose prayers brought rain and saved the army ab. 170.

**Legion of Honor.** Order instituted 1802 by Napoleon. It has several grades, and is conferred for conspicuous civil and military service.

**Legislation:** ENACTING LAWS. In modern states this function is generally performed by representatives of the people organized in two chambers.

**Legislatures.** In BELGIUM, senators are elected for 4 years, and representatives for 8 years, the number of the latter being twice the former.

FRANCE.—Senate consists of 300 members, elected for 9 years, and Chamber of Deputies, elected for 4 years.

GERMANY.—Empire Federal Council has 58 members appointed by the government of the individual States, and the Diet has 397, elected for 5 years.

GREAT BRITAIN.—House of Lords consists of 571 peers, hereditary and appointed, and 26 bishops; House of Commons has 670 elected members.

ITALY.—Senate has 397 life members appointed by the king, and House of Deputies of 508 elected members.

SPAIN.—Senate is composed of 100 hereditary members, 100 life members appointed by the king, and 180 elected for 10 years. The Lower House has 431 deputies, elected.

SWITZERLAND.—State Council has 2 members from each of 21 cantons, and National Council of 147 members, both classes elected for 3 years. See CONGRESS OF U. S.

**Legitimists.** Followers of the elder Bourbon line, as opposed to the Orleanists. See BOURBON, HOUSE OF.

**Legnano.** Town of n. Italy, on the Adige. Here a German army under Frederic I. was defeated by the Lombards, May 29, 1176. Pop. ab. 7,000.

**Legouvé,** GABRIEL ERNEST WILFRID, b. 1807. French dramatist, Academician 1855. *Medea; Recollections of 60 Years*, 4 vols., 1885–88.—His father, GABRIEL MARIE, 1764–1812, was a poet and dramatist.

**Legrand du Saulle,** HENRI, 1830–1886. French physician, specialist in mental disorders. *Médecine légale*, 1886.

**Legros,** ALPHONSE, b. 1837. French painter, in England from 1863; prof. Univ. Coll., London, 1876.

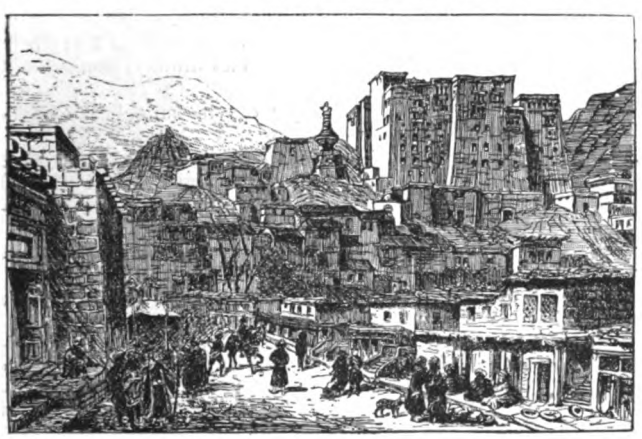
**Legs** (OF BIRDS). See PEDES.

**Legume.** Apocarpous dry fruit or pod, dehiscent along both ventral and dorsal sutures, as in plants of the Pea family.

**Legumin.** See CASEIN.

**Leguminosæ.** Natural family of flowering plants of the class *Angiospermæ*, and sub-class *Dicotyledons*, comprising 428 genera and ab. 7,000 species, widely distributed throughout the globe; called the Pulse family.

**Leh.** Capital of Ladakh, an Indian state in Kashmir, 11,500 ft. above the sea, inclosed by towered walls; 160 m.



Leh.

e. of Srinagar, it does a large transit trade between Thibet and Tartary, while shawl-wool from those countries finds its chief market here. Pop. ab. 4,000.

**Lehigh.** River of e. Pa., rising in Luzerne co., and flowing s. and e. to the Delaware at Easton. Length ab. 120 m. Its scenery at and above Mauch Chunk is notable.

**Lehigh University.** At S. Bethlehem, Pa.; founded 1865 by Asa Packer. It has four courses in engineering, one each in chemistry, architecture, and metallurgy, and three in letters; 12 professors, 25 instructors, and 415 students, chiefly technical; a fine campus with extensive buildings, an endowment of $1,500,000, and a library of 100,000 vols., with an endowment of $500,000.

**Lehmann,** CHARLES, 1814–1882. German-French painter. —His brother, RODOLPHE, b. 1819, has lived mainly in England and Italy.

**Lehmann,** JOHANN GEORG CHRISTIAN, 1792–1860. Director Botanical Gardens in Hamburg. *Novarum et minus cognitarum stirpium pugillus*, 1828–57; *Plantae Prussianæ*, 1844–48.

**Lehmann,** LILLI, b. 1848. German dramatic prima donna, member of the Court Opera in Berlin. She came to America 1885, and married the Berlin tenor, Paul Kalisch.

**Lehrs,** KARL, 1802–1878. Prof. Königsberg 1835; writer on the Greek poets; tr. Horace and Ovid. *De Aristarchi Studiis Homericis*, 1833.

**Leibnitz,** GOTTFRIED WILHELM, 1646–1716. German philosopher, mathematician, and diplomatist; librarian and counselor at Hanover from 1676; rival of Newton in discovering the theory of fluxions; peacemaker between Catholics and Protestants; constructor of a philosophy which opposed the sensationalism of Locke and the pantheism of Spinoza. Instead of one universal substance he asserted many, called monads, in various degrees of perfection: this was atomism minus materialism, and monism without pantheism. On this he founded

Gottfried Wilhelm Leibnitz.

freedom of will, as opposed to Spinoza's fatalism. *Protogoea*, 1680, became the foundation of the later Plutonic theory. In it he clearly enunciated the conception of a primitive molten world gradually undergoing refrigeration; but while he attributed a direct igneous origin to the naked, hard rocks of the earth, he recognized the action of water in the formation of stony and earthy strata. He contributed largely to *Acta Eruditorum*, 1682–92, and discovered, later than Newton but independently, the Differential and Integral Calculus. *Théodicée*, 1710; *Monadologie*, 1714; *L'Entendement Humain*, 1765; *Systema Theologicum*, 1819. His works were partially collected 1768 and later.

**Leicester.** Borough of England, on the Soar, 38 m. e.n.e. of Birmingham; chartered by John; burial-place of Richard III.; twice taken 1644–45; noted for its manufactures of hosiery. Pop., 1891, 142,051.

**Leicester.** See SHEEP.

**Leicester,** ROBERT DUDLEY, EARL OF, 1533–1588. Favorite of Elizabeth; husband, 1550, of Amy Robsart, who was probably murdered 1560, of Lady Sheffield 1573, and of the Countess of Essex 1578; made Earl 1564; commander in Holland 1585–87, and at home against the Armada 1588; a pretentious and shallow personage, of factitious historical importance.

**Leicester,** SIMON DE MONTFORT, EARL OF. See MONTFORT.

**Leichhardt,** FRIEDRICH WILHELM LUDWIG, 1813–1848. German explorer of Australia. He traversed Queensland from s. e. to n.w. 1844–45, and pub. a *Journal* of the expedition 1847. He started w., Nov. 1847, to cross the continent, and was last heard from April 1848.

**Leiden.** See LEYDEN.

**Leidy,** JOSEPH, M.D., LL.D., 1823–1891. Prof. of Anatomy Univ. Pa. from 1853, and of Natural History in Swarthmore Coll. 1871; pres. Academy of Natural Sciences, Phila. *Extinct Mammalian Fauna of Dakota and Nebraska*, 1870; *Vertebrate Fauna*, 1873; *Fresh Water Rhizopods*, 1879.

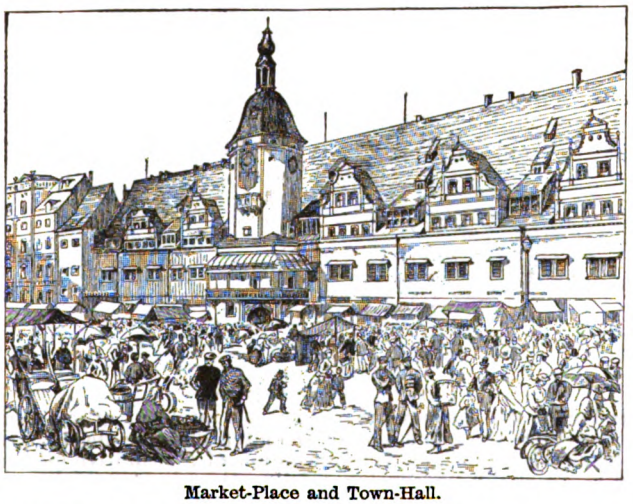
**Leighton,** FREDERICK, LORD, 1830–1896. Leading English painter of historical, classic, and imaginative subjects, and of portraits; ranking also among the first modern sculptors; R.A. 1869, pres. R.A. 1878; Baronet 1886, Baron 1896. His statue of *The Sluggard* was at the World's Columbian Exposition, Chicago, as were several of his best pictures, *Perseus and Andromeda*, *Hercules wrestling with Death for the body of Alcestis*, and *Garden of the Hesperides*.

**Leighton,** ROBERT, 1611–1684. Bp. of Dunblane 1661, Abp. of Glasgow 1672–74; a saintly and unworldly man, who held his office under protest, and made haste to resign it and escape into obscurity. His works, all posthumous, are still highly valued. —His father, ALEXANDER, M.D., 1568–1646, for a violent book, *Sion's Plea against Prelacie*, 1628, was whipped, clipped, branded, pilloried, heavily fined, and imprisoned 1629–40.

**Leinster.** Originally one of the five kingdoms of Ireland, comprising the s. e. portion; now part of one of the four provinces. King Dermot's abduction (1152) of Devorgilla, wife of the Lord of Connaught, is said to have caused the English invasion and conquest.

**Leiotrichi.** See MAN.

**Leipzig,** or LEIPSIC. City of Saxony, at the junction of the Pleisse, Parthe, and Elster rivers. It dates from ab. 900, has a commerce second only to that of Hamburg and in publishing and bookselling is one of the chief cities of Europe. Its university, founded 1408, had in 1895 nearly 200 instructors, 3,112 students, and a library of ab. 500,000 vols. and 4,000 MSS. It suffered heavily in the Thirty Years' War. Near it, at Breitenfeld, the Imperialists under



Market-Place and Town-Hall.

Tilly were defeated by Gustavus Adolphus, Sept. 7, 1631, and by Swedes under Torstensen, Oct. 23, 1642. Here a great battle was fought, Oct. 16–18, 1813, between Napoleon's forces, 160,000 strong, and the allied armies of Austria, Russia, and Prussia, 280,000. The French were beaten with a loss of 15,000 dead, as many wounded, 38,000 prisoners, and 300 cannon; the Prussians lost 16,000, Russians 21,000, Austrians 14,000. L. has increased tenfold since 1800. Pop., 1891, 354,900.

**Leishman,** WILLIAM, M.D., 1833–1894. Prof. Glasgow 1868–93. *Midwifery*, 1873.

**Leisler,** JACOB, d. 1691. Born in Germany; Commissioner Admiralty in New York 1683–88. He headed a revolt against the Jacobite office-holders 1689, became head of the provisional government, and was executed for treason by Gov. Sloughter. His attainder was reversed 1695.

**Leith.** Seaport of Scotland, on the Frith of Forth; port of Edinburgh. Shipbuilding and commerce are the leading industries. Pop., 1891, 67,660.

**Leitha.** Branch of the Danube, forming part of the boundary between Austria and Hungary.

**Leitner,** GOTTLIEB WILHELM, b. 1830. German traveler and linguist. *Arabic Grammar*.

**Leitneriaceæ.** Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Dicotyledons*, consisting of a single genus and species, inhabiting the s. U. S.

**Leixner,** OTTO VON, b. 1847. German critic and literary historian.

**Leland,** CHARLES GODFREY, b. 1824. American essayist and poet, tr. of Heine, 1863, and Scheffel, 1872. *Hans Breitmann's Ballads*, 1869–71; *Gypsies*, 1873–82; *Fu-Sang*, 1875; *Etruscan-Roman Remains*, 1892. He lives chiefly in Europe, and has done much for industrial teaching.

**Leland,** JOHN, ab. 1505–1552. English antiquarian.

**Leland,** JOHN, D.D., 1691–1766. Pastor in Dublin from 1716. After answering Tindal, Morgan, and others, he pub. *A View of Deistical Writers*, 1754–56.

**Leland Stanford Junior University.** At Palo Alto, Cal.; founded 1885, and opened 1891 to both sexes. It has, 1896, a teaching staff of 83, with 102 graduate, 777 undergraduate, and 190 special students. The library contains 30,000 vols. Senator Stanford endowed the institution by his will with $2,500,000, besides giving valuable estates amounting to 89,400 acres.

**Lelewel,** JOACHIM, 1786–1861. Polish historian, resident in Brussels from 1833.

**Leloir,** ALEXANDRE LOUIS, 1843–1884. French painter.

**Lelong,** JACQUES, 1665–1721. French librarian and bibliographer. He pub. catalogues of editions of the Bible, 1709, and of French historians, 1719.

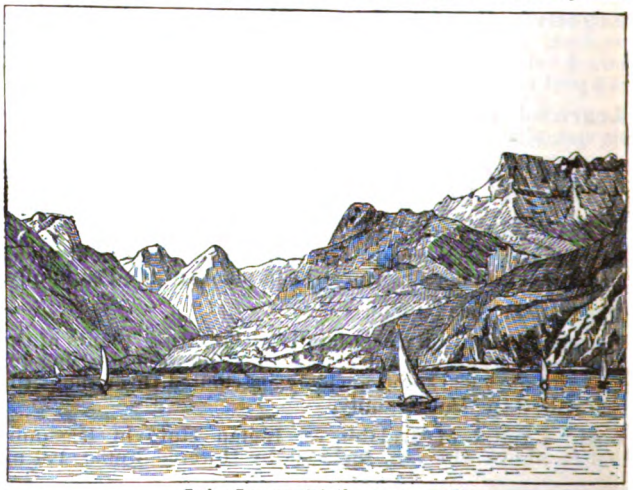
**Lely** (VAN DER FAES), SIR PETER, 1617–1680. Flemish portrait painter, in England from 1642; court painter to Charles II.; the English aristocracy of the time is mainly known to us by his portraits and those of Kneller.

**Lemaire,** NICOLAS ÉLOI, 1767–1832. Prof. Paris; editor of Latin classics.

**Lemaitre,** FREDERIC, 1798–1876; French actor, prominent 1832–68, and strongest in romantic parts.

**Lemaitre,** JULES, b. 1853. French critic, poet, dramatist, and novelist, Academican 1895.

**Leman** (or GENEVA), **Lake.** At an altitude of 1,218 ft., this lake extends 45 m. e. and w., with a maximum breadth of 9 m. and area of 233 sq. m. At certain seasons of the year its



Lake Leman (at the upper end).

waters oscillate with a rise and fall of from 2 to 5 ft. in 10 minutes. The Rhone, entering at one end muddy, issues forth at Geneva transparent.

**Lemaneaceæ.** Order of *Algæ* of the sub-class *Rhodophyceæ*, inhabiting fresh water.

**Le Mans.** Manufacturing town of France on the Sarthe. Here the Republicans defeated the Vendeans, Dec. 1793, and the French were defeated by the Germans, Jan. 11–12, 1871. Pop., 1891, 57,412.

**Le Maout,** JEAN EMMANUEL MARIE, 1800–1877. Prof. Paris. *Traite general de Botanique*, 1868.

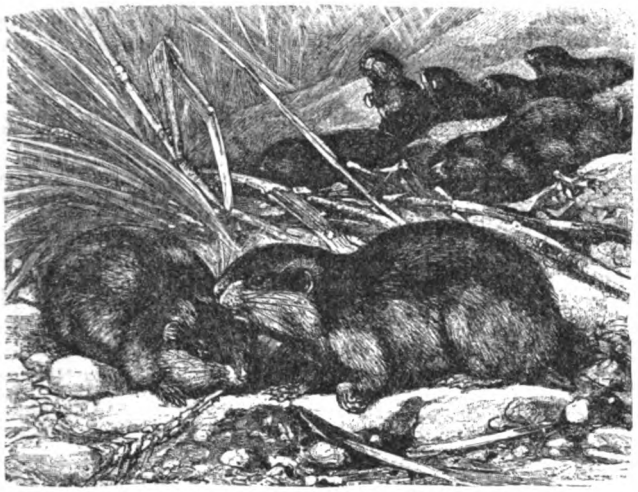
**Lembcke,** CHRISTIAN LUDVIG EDVARD, b. 1815. Danish poet, translator of Shakespeare and Byron.

**Lemberg.** City of Austrian Poland, on the Peltew; founded 1259; now capital of Galicia. It has two cathedrals built ab. 1400, and a university, founded 1784, with 35 instructors and over 1,000 students, and a national institute, started 1817, with a valuable Polish library and collections. Pop., 1890, 127,943.

**Lemery,** NICOLAS, 1645–1715. French phlogistonist, teacher and experimenter. *Cours de Chymie*, 1675.

**Lemma.** Proposition introduced and proved, not in proper sequence, but solely as auxiliary to another theorem.

**Lemmings.** Arctic Myomorpha of Norway, including voles with chubby body, short tail and limbs, small eyes and ears, and soft fur; noted for their migrations, 5 to 20 years apart. They appear suddenly in enormous numbers and move



Lemming (*Myodes lemmus*).

straight on across lakes, rivers, etc., until they drown in the sea; meanwhile their numbers are depleted by the preying of numerous enemies. The snowy lemming turns white in winter: it is 4 to 6 in. long. The young are 3 to 8 in number.

**Lemnian Earth.** Variety of CIMOLITE (q.v.).

**Lemniscate** (OF BERNOUILLI). Cassian oval, the product of whose focal radii equals the square of half the distance between the foci. It is the locus of the intersections of tangents to an equilateral hyperbola, with perpendiculars drawn to them from the center.

**Lemnisci.** Segmental organs of *Acanthocephala.*

**Lemnos.** Island in the Ægean; held by Turkey since 1657; sacred to Vulcan, who was said to have fallen here when flung from heaven by Jupiter; it contains an extinct volcano. Vulcan's forges were sometimes placed here.

**Le Moine,** JAMES MACPHERSON, b. 1825. Canadian writer, chiefly in French, on history, ornithology, scenery, and archæology.

**Lemoinne,** JEAN EMILE, b. 1815. French journalist and critic, Academician 1876. *Études*, 1852–62.

**Lemon.** *Citrus limonum.* Small tree of the Orange family, with laurel-like leaves, native of n. India, widely cultivated in warm countries. The fruit is an important article of commerce.

Lemon (*Citrus limonum*).

**Lemon,** MARK, 1809–1870. English dramatist and humorist, ed. *Punch* from its inception, 1841.

**Lemon,** OIL OF. Volatile oil obtained by pressure or distillation from lemon peel. Used in perfumery and in flavoring. Often adulterated with turpentine, lavender, and alcohol.

**Lemon-Grass.** *Andropogon schœnanthus.* Large Indian grass, yielding a volatile oil used in perfumery.

**Lemonnier,** PIERRE CHARLES, 1715–1799. French astronomer, one of the 144 original members of the Institute.

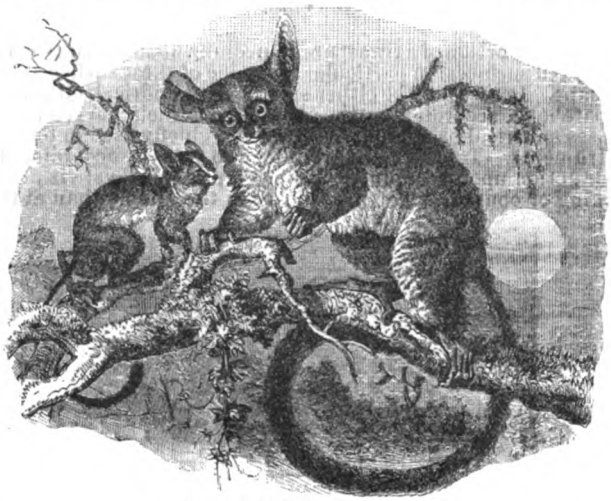
**Le Moyne,** CHARLES, 1626–1683. French settler in Canada 1641; captain of Montreal.—His eldest son, CHARLES, 1656–1729, became Gov. of Montreal and Baron de Longueuil 1700. His brothers were prominent in Canadian or French history.

**Lempriere,** JOHN, D.D., ab. 1760–1824. English author of a *Classical Dictionary*, 1788–92, long in general use, and of a *Dict. of Biography*, 1808.

**Lemures.** In Roman Mythology, specters of the dead, who wander about by night, and torment and frighten the living; generally identified with larvæ.

**Lemuroidea.** See PROSIMII.

**Lemurs** (LEMURIDÆ). Family of *Prosimii.* They have two pairs of incisors in each jaw; the lower ones are directed forward, the canines absent. They are quadrumanous, with flat nails on all the digits except the second of the pairs, which has a sharp claw. Nearly all belong to Madagascar. They are gentle, mostly nocturnal, and easily domesticated animals, ranging in size from a fox to a squirrel. The INDRIS (q.v.)



Lemurs (*Otolicnus galago*).

have but one young to a birth. *Propithecus* leaps on his hind legs, and can clear 30 ft. at a bound. The woolly lemur has 36 teeth and a pair of pectoral mammæ; it has a tail half as long as the body, is gregarious, quadrupedal and diurnal. It feeds on fruit buds, eggs, birds, insects, and takes pleasure in roaring loudly at evening. One or two young are born at a time. *Galago* of Africa has a long tarsus, with very large eyes, and jumps like a jerboa. The *Nycticebinæ* includes the slow lemurs of the East Indies. See LORIS.

**Lena.** One of the largest rivers of Siberia. It heads in the Baikal Mts., w. of Lake Baikal, flows generally n. e. and n., and empties into the Arctic Ocean. Length ab. 2,900 m., mostly navigable in summer. With its numerous branches it drains an area of over 1,000,000 sq. m. Its delta is 250 m. wide. Here Lieut. De Long and 14 of his men perished 1881, after the loss of the *Jeannette.*

**Lenartowicz,** TEOFIL, b. 1822. Polish poet, living in Italy.

**Lenau** (or **von Strehlenau**), NICOLAUS, 1802–1850. German poet, noted chiefly for his lyrics. *Works*, 4 vols., 1855.

**L'Enclos,** NINON (ANNE) DE, 1616–1706. Parisian beauty, whose attractions, personal, social, and intellectual, were maintained to a great age.

**Le Neve,** JOHN, 1679–ab.1740. English compiler and biographer. *Monumenta Anglicana*, 9 vols., 1700–19; *Fasti Eccl. Anglicanæ*, 1716; *Lives of Bishops*, 1720; *Archbishops*, 1723.

**Lenfant,** JACQUES, 1661–1728. French Protestant pastor at Berlin from 1688, historian of the Councils of Constance (1714–27, tr. 1730), Pisa, 1724, and Basle, 1731.

**Leni-Lenapi.** Group of Algonquin Indian tribes that occupied e. U. S. north of Cape Hatteras. The Mohicans and Adirondacks were in s. New England and N. Y.; s. of these were the Minsi, Delawares, Susquehannocks, etc., while the Chesapeake Bay region was occupied by the Powhatonic confederacy of nearly 30 tribes.

**Lennep,** JACOB VAN, 1802–1868. Dutch poet, dramatist, and novelist; son of DAVID JACOB, 1774–1853, prof. at Amsterdam, ed. of Ovid and Hesiod.

**Lenngren,** ANNA MARIA, 1754–1817. Swedish poet.

**Lennoaceæ.** Natural family of flowering plants, of the class *Angiospermæ*, sub-class *Dicotyledons*, and series *Gamopetalæ*, comprising 3 genera and ab. 4 species of saprophytic herbs, natives of America.

**Lennox,** MRS. CHARLOTTE (RAMSAY), 1720–1804., b. in N.Y.; English novelist.

**Lennox,** LORD WILLIAM PITT, 1799–1881. English novelist.

**Lenormant,** FRANÇOIS, 1837–1883. French historian and Orientalist, prof. in Paris 1874. *Ancient History of the East,*

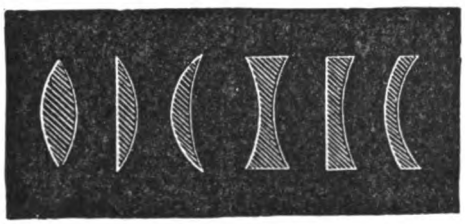
3 vols., 1868–69; *First Civilizations*. 1874; *Money of Antiquity*, 3 vols., 1879; *Origins of History*, 3 vols., 1880–84. His pursuits were mainly those of his father, CHARLES, 1802–1859, an eminent Egyptologist, numismatist, and archæologist, prof. in Paris 1835.

**Le Nôtre,** ANDRE, 1613–1700. Director of royal gardens in France; ennobled 1675. His influence was long visible in many public and private parks.

**Lenox.** Village of Berkshire co., Mass., in a region of much beauty; now rivaling Newport as a summer home of wealth. Pop., 1890, ab. 3.000.

**Lenox,** JAMES, 1800–1880. Founder of the Lenox Library, New York, 1870.

**Lens.** Portion of a transparent medium, bounded in general by curved surfaces: in particular cases one of these surfaces may be plane. Lenses may be either spherical, cylindrical, elliptical, or parabolic, according to the character of their curved faces. Lenses spherical or approximately so are chiefly used in optical instruments. They are divided into two classes, according to their action upon a luminous beam of parallel rays; viz., converging or convex, which are thicker in the middle than at the



Lenses.

edges, and diverging or concave, which are thinner in the middle. Of each class there are three forms, the double-convex, plano-convex, and converging meniscus, double-concave, plano-concave, and diverging meniscus. Achromatic lenses refract light, without dispersion, which produces colored fringes. They are formed by a double convex lens of crown glass with a plano-concave lens of flint glass, first devised 1757 by J. DOLLAND (q.v.).

**Lens.** Town of n. France, 17 m. s.w. of Lille. Here the French under Condé defeated the Spaniards, Aug. 20, 1648. Pop. ab. 12,000.

**Lenström,** CARL JULIUS, b. 1811. Prof. Upsala 1836; Swedish theologian, poet, and literary historian.

**Lent.** Season from Ash-Wednesday to Easter; originally forty hours, finally lengthened to forty days, commemorating Christ's fast. Its last week, called Holy Week, or Passion Week, begins with Palm Sunday, and includes Good Friday and Easter eve.

**Lenthall,** WILLIAM, 1591–1662. Speaker of the Long Parliament 1640–53; Baron 1654.

**Lenthéric,** CHARLES PIERRE MARIE, b. 1837. French engineer, author of valuable books on the antiquities of the Mediterranean coast. *La Grèce et l'Orient en Provence*, 1878; *Les Villes Mortes du Golfe de Lyon*, 1875; *La Provence Maritime*, 1879, tr. as *The Riviera, Ancient and Modern*, 1895.

**Lentibulariaceæ.** Natural family of flowering plants, of the class *Angiospermæ*, sub-class *Dicotyledons*, and series *Gamopetalæ*, comprising 4 genera and ab. 200 species, distributed throughout the warm and temperate regions of the earth; called the Bladderwort family.

**Lenticels.** Structures occurring in the bark of twigs and branches of woody plants, by means of which transpiration is effected. They are a development of the corky layer, and abundantly provided with intercellular spaces.

**Lenticular Truss.** Bridge truss in which both upper and lower chords are curved. By this arrangement the stresses in the chords are nearly uniform throughout. It is mainly used for highway bridges of moderate span, but the Saltash bridge, built 1860 by Brunel, has a span of 455 feet.

**Lentigo.** See FRECKLES.

**Lentil.** *Ervum lens*. Climbing herb of the Bean family, probably native of w. Asia, cultivated from remote antiquity for its seeds, which are ground into meal.

**Lentino,** JACOPO DA, d. ab. 1250. Italian lyric poet.

**Lentulus,** d. 63 B.C. Roman consul 71 B.C.; colleague of Catiline in the conspiracy exposed and frustrated by Cicero; executed.

**Lenz,** JACOB MICHAEL REINHOLD, 1751–1792. German poet and dramatist.

**Lenz,** OSCAR, Ph.D., b. 1848. German explorer in w. Africa.

**Lenz's Law.** Governing the electromagnetic action of currents and magnets; enunciated soon after the discovery of Faraday. In all cases of induction by the motion of magnets or currents, the induced current has a direction such that its electromagnetic action on the inducing system tends to oppose the motion producing it.

**Leo.** See ZODIAC.

**Leo I.,** ST., ab. 390–461. Roman official, Pope 440; an able and masterful man, active in all directions, almost creator of the Mediæval papacy. He prevailed on Attila to spare the city 452, and mitigated the horrors of the sack by Genseric 455. His works have often been pub.—II. Pope 682–683.—III. 795–816: he crowned Charlemagne 800.—IV. 847–855.—V. 903.—VI. 928–929.—VII. 936–939.—VIII. 963–965.—IX. Bruno, an Alsatian, 1002–1054, Bp. of Toul 1026, Pope 1049; a reformer, influenced by Hildebrand.—X. Giovanni dei Medici, 1475–1521, son of Lorenzo, Abbot at 7, Cardinal at 13, exiled 1494, Pope 1513, a patron of art and letters. The corruptions, which he did nothing to check, promoted the Reformation.—XI. Another Medici, Abp. of Florence 1574, Pope April 1605.—XII. Annibale della Genga, 1760–1829, Abp. of Tyre 1793, Cardinal 1816, Pope 1823, a missionary and reformer.—XIII. Giovacchino Vincenzo Pecchi, b. 1810, Abp. of Perugia 1846, Cardinal 1853, Pope 1878; personally held in general esteem.

**Leo III.,** "THE ISAURIAN," d. 741. Byzantine Emperor 718; peasant, from Asia Minor and Thrace; general; able soldier and ruler.

**Leo,** HEINRICH, 1799–1878. Prof. Halle 1828. *Hist. Italian States*, 5 vols., 1829; *Universal History*, 10 vols., 1835–44.

**Leo,** LEONARDO, 1694–1746. Italian musician of the Neapolitan School, equally eminent as church and theater composer; pupil of A. Scarlatti; teacher of Jomelli and Piccini. He wrote 60 operas and many masses, motets, etc.

**Leo Africanus** (ALHASSAN IBN MOHAMMED ALWAZZAN), ab.1480–ab.1530. Spanish Moor, traveler in Africa, captive and temporary convert at Rome ab. 1518; author of a book on Africa pub. 1559.

**Leochares,** 4th century B.C. Greek sculptor of Athens.

**Leo Diaconus,** 10th century. Byzantine historian. His book, extending 959–975, was pub. 1819.

**Leon.** Early kingdom of n. Spain, founded 746 by Alfonso; united to Castile by Ferdinand III. 1230.

**Leon.** Chief city of Nicaragua, and its capital till 1870; founded 1523 on Lake Managua; removed 1610 to 50 m. w., near

The Main Thoroughfare, Leon.

the Pacific; pillaged 1685 by Dampier. It has a college, founded 1678, and a large cathedral, built 1746–74. Pop., with an older Indian suburb, Subtiaba, ab. 30,000.

**Leon.** City of Guanajuato, central Mexico; founded 1576. It has manufactures of leather and cotton. Pop. ab. 50,000.

**Leonard,** HUBERT, 1819–1890. Belgian violinist, pupil of the Paris Conservatoire, prof. Brussels Conservatoire from 1848–67. *Gymnastique du Violiniste; Petite Gymnastique du jeune Violiniste; 24 Études classiques; Études harmoniques; École Leonard; L'ancienne école italienne;* aslo concertos, fantasias, etc., for the violin.

**Leon,** JUAN PONCE DE. See PONCE DE LEON.

**Leon,** LUIS PONCE DE, 1527–1591. Spanish poet and devotional writer.

**Leonard,** DANIEL, 1740–1829. Loyalist of Mass., in exile from 1776; long Chief-justice of Bermuda.

**Léonard,** NICHOLAS GERMAIN, 1744–1793. French author, long in Guadeloupe, W. Indies.

**Leonardo da Vinci.** See VINCI.

**Leonardo of Pisa,** b. ab. 1175. Introducer of Arabic mathematics to the knowledge of w. Europe. *Liber Abaci*, 1202; *Practica Geometrica*, 1220.

**Leoncavallo,** RUGGIERO, b. 1858. Italian composer, whose opera, *I Pagliacci*, produced in Milan May 31, 1892, created a sensation. Subsequent works, *I Medici*, 1893, and *Chatterton*, were unsuccessful.

**Leonhard,** GUSTAV, 1816–1878. Geologist and mineralogist, prof. Heidelberg. *Handwörterbuch der topographischen Mineralogie*, 1843; *Grundzüge der Geognosie und Geologie*, 1851–74. He edited *Jahrbüch für Mineralogie, Geognosie, und Petrefactenkunde.*

**Leonhard,** KARL CÆSAR VON, 1779–1862. Prof. of Mineralogy at Heidelberg from 1818; editor of *Taschenbuch für die gesammte Mineralogie*, 1807–29, and later of *Neues Jahrbuch für Mineralogie.*

**Leoni,** LEONE, 1509–1590. Italian sculptor and worker in metals.

**Leonidas,** d. 480 B.C. King of Sparta ab. 491 B.C.; slain in the defense of Thermopylæ.

**Leonidas.** 1. Greek lyric poet of Tarentum, 3d century B.C. 2. Epigrammatist of Alexandria and Rome, ab. 60.

**Leonides.** Meteoric swarm having its radiant in the constellation Leo. The earth encounters it Nov. 12, 13. There is a great display at intervals of 33 years.

**Leonine City.** Part of Rome w. of the Tiber, comprising the Vatican, St. Peter's, and the Castle of St. Angelo; inclosed by a separate wall; fortified by Leo IV.

**Leonine Verses.** Rhymed Latin poetry, usually in hexameter or pentameter; familiar from ab. 1100.

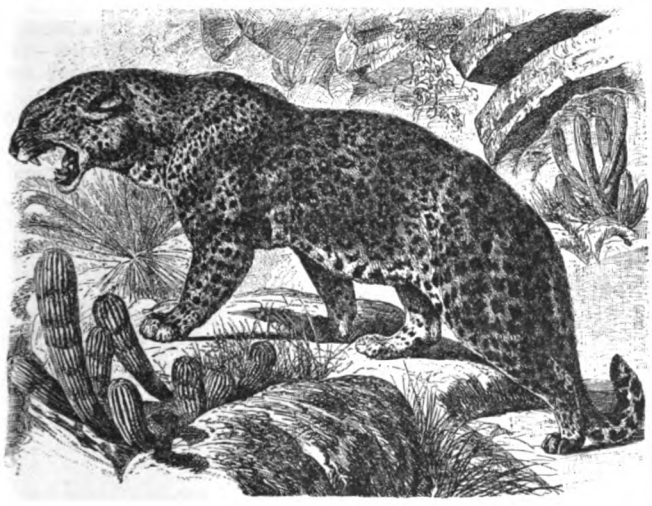
**Leonnatus,** d. 322. General of Alexander; ruler in Phrygia; killed in Thessaly, in the Lamian war.

**Leonowens,** ANNA HARRIETTE (CRAWFORD), b. 1834. Anglo-American teacher and author, in Siam 1863–67. *Governess at the Court of Siam*, 1870; *Romance of the Harem*, 1872.

**Leontius,** 6th century. Monk of Constantinople, writer against heresies.

**Leonzio Pilato,** d. 1366. Greek teacher in Italy; first translator of Homer into Latin.

**Leopard.** Arboreal cat, ab. 4 ft. long, spotted with black, or nearly uniformly black; is found from Japan to w. Africa;



Leopard (*Felis pardus*).

also called panther and pard. The name was first given to the cheetah. See FELIDÆ.

**Leopardi,** GIACOMO, 1798–1837. Italian poet and essayist of great ability but deeply pessimistic views. *Canzoni*, 1824; *Operette morali*, 1827, tr. 1882.

**Leopold I.,** 1640–1705. King of Hungary 1655, and of Bohemia 1658; Emperor 1658, succeeding his father, Ferdinand III.; involved in three wars with France. His coins are abundant, and explain his nickname, "Hog-mouth." The Turks invaded Hungary 1662–64, held Transylvania, and besieged Vienna 1683.

**Leopold II.,** 1747–1792. Son of Francis I.; Grandduke of Tuscany 1765; German Emperor 1790; a wise and pacific ruler.—His grandson and namesake, 1797–1870, ruled Tuscany 1824–59, and edited Lorenzo de Medici's works 1825.

**Leopold I.,** 1676–1747. Prince of Anhalt-Dessau; Prussian general 1693–1745. Eminent as a military organizer, and active in several wars.

**Leopold I.,** 1790–1865. King of Belgium from 1831; son of the Duke of Saxe-Coburg; in England 1816–31; succeeded by his son, LEOPOLD II., b. 1835, who became head of the Congo Free State 1885.

**Leopold,** CHRISTIAN GERHARD, b. 1846. Obstetrician at Leipzig and Dresden.

**Leopoldville.** Commercial station on the Congo, above the cataracts, ab. 240 miles from its mouth; founded by H. M. Stanley 1881. The river is hence navigable far into the interior of Africa.

**Leosthenes,** d. 322 B.C. Athenian general in the Lamian war. He besieged Antipater at Lamia 323 B.C.

**Leotychides,** d. 469 B.C. King of Sparta 491 B.C. He destroyed the Persian fleet at Mycale 479 B.C., but was accused of bribery by the ephors, and died in exile.

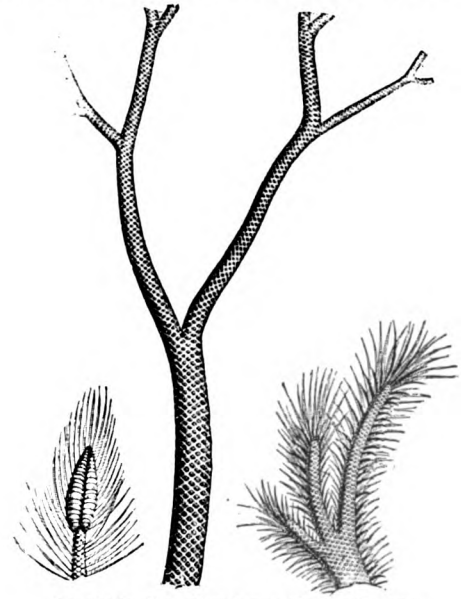
**Lepadoids.** Pedunculated Cirripedes. *Lepas* is the type.

**Lepanto,** GULF OF (GULF OF CORINTH). Scene of a memorable defeat of the Turkish fleet under Ali Pasha, by Don John of Austria, Oct. 7, 1571.

**Lepas.** See CIRRIPEDIA and PEDUNCULATA.

**Lepidine.** $C_{10}H_9N$. Methylquinoline. Bpt. 261°C. Liquid of basic odor, best prepared by heating chinchonine with an alkali; isomeric with quinaldine.

**Lepidodendreæ.** Order of extinct *Pteridophyta*, apparently related to the modern club mosses, but perhaps more closely to the *Selaginellaceæ*. They formed forest trees in the



*Lepidodendron sternbergii* (Carboniferous).

Devonian and Carboniferous eras, and their trunks and foliage contributed largely to the materials from which coal has been formed. The principal genera are *Lepidodendron* and *Sigillaria.*

**Lepidoganoids.** Ganoid fish with armor consisting of hard, bony, overlapping scales; head generally of naked bone, and teeth set in naked bony jaws; a type culminating in the Carboniferous Era. They include the *Amiadæ*, *Lepidosteidæ*, *Crossopterygidæ*, and *Acanthodidæ*. These forms have little exoskeletal development, while the endoskeleton is more or less ossified.

**Lepidolite.** Variety of mica, containing lithium and fluorine, usually of a reddish or violet color.

**Lepidomelane.** Mineral of the mica group, black or nearly black in color, opaque or nearly so, and differing from the other micas by having a large amount of iron in its composition.

**Lepidoptera** (BUTTERFLIES). Order of Insects, including forms having four similar wings, covered with scales, with the segments of the thorax fused and the body hairy. The antennæ are straight, but of variable form. The mouth parts are

adapted for sucking nectar from flowers, the maxillæ forming a long tube, spirally rolled when not in use. The œsophagus acts as a pumping organ. Some are parthenogenetic. The development is by complete metamorphosis from a caterpillar-larva through a pupa protected by a cocoon. The larvæ have three-jointed antennæ, six ocelli, and abdominal feet, besides the six thoracic ones. They damage trees and plants, but their ravages are kept limited by the *Ichneumonidæ*. There are six tribes, *Microlepidoptera*, *Geometrina*, *Noctuina*, *Bombycina*, *Sphingina*, and *Rhopalocera*. The last five are grouped as *Macrolepidoptera*.

**Lepidosauria** (SQUAMATA, PLAGIOTREMATA). Reptiles with scales and dermal shields; the quadrate is loosely articulated to the skull. They either are apodal or have legs. The anus is a transverse slit: the male intromittent organ is double. Two living orders are included, *Ophidia* (Snakes) and *Lacertilia* (Lizards). One order of fossils, the *Pythonomorpha*, may be placed here.

**Lepidosiren.** See DIPNEUMONA.

**Lepidosteus.** See EUGANOIDES.

**Lepidote.** Surfaces of leaves or other organs which are provided with scales or scurf.

**Lepidus,** MARCUS ÆMILIUS, d. 13 B.C. Consul with Cæsar 46 B.C.; gov. of Gaul 44; triumvir with Octavius (Augustus) and Antony, Oct. 43; gov. of Africa 40–36; overcome in Sicily by Octavius; pontifex maximus from 43.

**Lepocytode,** or LEPOCYTE. Protoplasmic cell having an investing membrane.

**Lepomonera.** Tribe of *Monera*, characterized by the formation of a cyst or protective shell about each moner during times when it is liable to be dried up, or when about to reproduce by spores. *Protomyxa* and *Vampyrella* are examples.

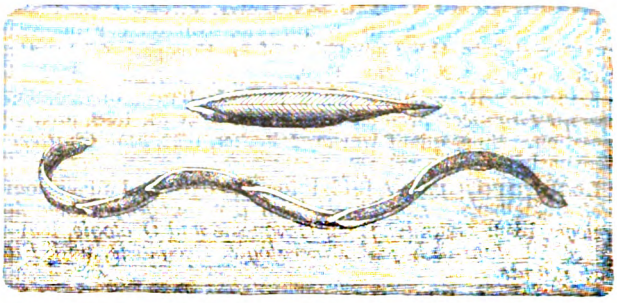
**Leporidæ.** See RODENTIA.

**Leporius.** Monk of Gaul and Africa, whose recantation of Pelagian doctrine, made ab. 425, was pub. 1630.

**Leprosy.** Chronic, constitutional disease, often lasting for years, known to have existed in Biblical times; most common in tropical countries, but found in nearly every portion of the world, and due to the presence in the system of a micro-organism, *Bacillus lepræ*. It is feebly contagious, but prolonged contact with an affected person is necessary; in cold or temperate climates, it is regarded as non-contagious. It occurs in three forms: the anæsthetic, in which the nerves are affected, causing loss of feeling or pain, and yellowish spots, one to two inches in diameter, occur, which are without feeling and sooner or later ulcerate; the tubercular, in which the nervous symptoms are absent and the eruption is nodular, causing thickening of the skin and consequent deformity; and the mixed variety, in which the symptoms of the two former are combined. Gangrene, gradual wasting and subsequent loss of the fingers, etc., are common, and death may result from exhaustion, ulceration, or the involvement of structures necessary to life. A fatal result is inevitable, and remedies calculated to build up the general health may prolong life, but no treatment has been successful in arresting the progress of the disease. Cases when found are isolated and kept from contact with the sound. At the present time there are five lepers under the control of the Health Department of New York City. In the Middle Ages they were compelled to wear black gowns and hoods, and to announce their presence by ringing a bell or sounding a clapper, and in some countries, when a case was found, the victim was garbed as above and the burial service was read in his presence. After this he was separated from his family and no further religious communion allowed, he being regarded as dead. In America the disease is not rare in Louisiana and Mexico and wherever numbers of Chinese are found. It is also found in Scandinavia, parts of France and Italy, and the Sandwich Islands.

**Lepsius,** KARL RICHARD, 1810–1884. German Egyptologist, author of the colossal *Denkmaler aus Egypten*, 12 vols., 1849–60, and many other works. He headed the Prussian exploring expedition to Egypt, 1842–45, was prof. in Berlin and director of the Egyptian section of the Berlin Museum, which he mainly founded. He was the first to interpret the hieroglyphics aright, and to apply scientific methods to early Egyptian history.

**Leptocardii** (CIRROSTOMI, PHARYNGOBRANCHII, BRANCHIOSTOMATIDÆ, ACRANIA). Transparent, lance-shaped fishes, without paired fins. A persistent notochord is present, but no vertebral segments, the segmentation being represented mainly by myotomes. The brain is rudimentary and not inclosed in a skull. The visual organ is a single pigment spot. An olfactory pit is present on the left side. No auditory organs are present. There are no jaws, the mouth being a slit supported by cartilages bearing ciliated cirri. There are numerous branchial clefts, that open into an atrial or peribranchial cavity, which in turn opens by a ventral pore. No heart is present; the blood-vessels are pulsatile and convey colorless blood. The sexes are separate. The reproductive organs are numerous



Lancelot (*Branchiostoma lanceolatum*).

paired bodies in the pharyngeal region, and their products escape with the respiratory water. A single genus, *Amphioxus* (or *Branchiostoma*), the Lancelet, found on sandy coasts of the Atlantic, represents the order.

**Leptoglossa.** See FISSILINGUIA.

**Leptolinæ.** Tubularian and Campanularian Hydroids, including the *Gymnoblastea-Anthomedusæ* and *Calyptoblastea-Leptomedusæ*.

**Leptome.** In Plant Anatomy, softer portions of fibro-vascular bundles in *Pteridophyta*.

**Leptomedusa** (CAMPANULARIÆ). Thin or flat medusæ which some hydroids produce.

**Leptophloem.** Central portion of the seta in mosses of the family *Polytrichaceæ*.

**Leptosporangium.** Spore-case derived from a single cell of the epidermis, as in most ferns.

**Leptostraca.** Genus of *Crustacea* (NEBALIA, q.v.), which is a connecting link between the *Entomostraca* and *Malacostraca*.

**Leptothrix.** Thread-like bacteria, different at the two extremities when the cells are short.

**Leptoxylem.** Supposed rudimentary xylem in mosses of the family *Polytrichaceæ*.

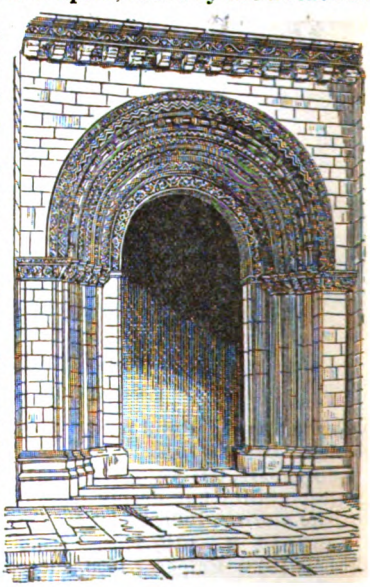
**Lepus.** Principal genus of the family *Leporidæ* (see RODENTIA), including HARES and RABBITS (q.v.).

**Lequesne,** EUGÈNE LOUIS, 1815–1887. French sculptor.

**Lerdo de Tejada,** SEBASTIAN, 1825–1889. Mexican Foreign Minister 1857–58 and 1867–71; pres. 1872–76, then in exile.—His brother, MIGUEL, 1814–1861, was a Minister of State, judge, and historical writer.

**Lerida.** Old town of n. e. Spain, taken by the French 1707 and 1810: near it Scipio defeated the Carthaginians 216 B.C., and Cæsar overthrew Pompey's party 49 B.C. It had a university 1300–ab. 1725. Pop. ab. 22,000.

**Lérins.** Small islands in the Mediterranean, near Cannes; held by France. On Ste. Marguerite, anciently Lero, now a convict station, the Man in the Iron Mask was confined 1686–98, and Gen. Bazaine 1874. St. Honorat, or Lerina, was the site of a rich and famous convent, founded 400, plundered by Arabs in 8th century, by Saracens 10th, and more effectually by the Avignon popes 1305–77.



Lerida Old Cathedral (Door of South Porch).

**Lerma,** FRANCISCO DE ROXAS, MARQUIS, ab. 1555–1625. Spanish Prime Minister 1598–1618; Duke 1598, Cardinal 1618. He did much to advance the ruin of Spain, initiated and largely accomplished by Philip II.

**Lermontoff,** MIKHAIL YUREVICH, 1814–1841. Russian poet, esteemed next to Pushkin; of Byronic tendency. *The Demon*, 1834, tr. 1886. He wrote one novel, *A Hero*, 1839, and died in a duel with a fellow-officer whom he had satirized.

**Leroux,** PIERRE, 1797–1871. French editor, philosopher, and poet, in exile 1851–69. *Humanity*, 1839; *Malthus*, 1848; *Job*, 1863.

**Leroy-Beaulieu,** PIERRE PAUL, b. 1843. French economist, prof. in Paris 1872, founder 1873 and ed. *L'Economiste*. His *Empire of the Tsars*, tr. 1894, is probably the best book on Russia.

**Leroy de Saint-Arnaud,** JACQUES ACHILLE, 1801–1854. French general and Minister of War 1851, Marshal 1852; commander in the Crimea 1854.

**Leroy d'Etiolles,** JEAN JACQUES JOSEPH, 1798–1860. French surgeon; inventor of instruments for operating. *Hist. de Lithotritie*, 1839; *Urologie*, 1845.

**Léry,** JEAN DE, 1534–1611. French Huguenot writer. *Siege of Sancerre*, 1574; *Journey in Brazil*, 1578.

**Lesage,** ALAIN RENE, 1668–1747. French dramatist and novelist. *Le Diable Boiteux*, 1707. His great work, *Gil Blas*, appeared in 4 vols. 1715–35, and was repeated or imitated in his *Bachelor of Salamanca*, 1736–38. His most important comedies are *Crispin*, 1707, and *Turcaret*, 1709. He drew largely on Spanish originals.

**Lesbos,** or MYTILENE. Largest island in the Ægean Sea; birthplace of Terpander, Alcæus, and Sappho; held by Turkey since 1462.

**Lescarbot,** MARC, ab.1570–ab.1630. French traveler. *Hist. New France*, 1609–18; *La Suisse*, 1613.

**Lesches,** 7th century B.C. Greek poet of Lesbos. His *Little Iliad* is counted fourth in the Cyclic series.

**Lesley,** JOHN, 1527–1596. Prof. Aberdeen 1554; Bp. of Ross; active on behalf of Mary Stuart; in exile from 1573; Bp. of Coutances 1593; author of a history of Scotland, mostly in Latin.

**Lesley,** J. PETER, b. 1819. Associate on Pa. Geological Survey 1839–41; Prof. Univ. Pa. 1872; Chief Geologist of 2d Pa. Survey 1874; chief authority on coal questions in the U. S.; *Coal and its Topography*, 1856. He has edited more than 100 volumes and atlases in connection with the survey.

**Leslie,** CHARLES, 1650–1722. Irish nonjuror, who wrote against Jews, Quakers, Socinians, and Romanists. His *Method with Deists*, 1694, was long popular.

**Leslie,** CHARLES ROBERT, 1794–1859. English painter, R.A. 1825, prof. R. A. 1848–51; biographer of Constable and Sir J. Reynolds. *Handbook for Young Painters*.—His son, GEORGE DUNLOP, became R.A. 1876: his sister, ELIZA, 1787–1858, lived in the U. S., and wrote popular cook books and stories.

**Leslie,** FRANK (HENRY CARTER), 1821–1880. Anglo-American publisher of periodicals. His business was continued in New York by his widow.

**Leslie,** SIR JOHN, 1766–1832. Prof. of Mathematics in Univ. Edinburgh 1805, and of Natural Philosophy from 1819; inventor of several instruments, and of artificial refrigeration 1810; knighted 1832; author of sundry text-books. Tr. Buffon's *Birds*, 1793; *Heat*, 1804.

**Leslie,** THOMAS EDWARD CLIFFE, 1827–1882. Prof. of Economics at Queen's Coll., Belfast, 1853. *Land Systems*, 1870; *Essays in Political and Moral Philosophy*, 1879.

**Leslie's Cubes.** Cubical canisters, filled with hot water, and used by Sir J. Leslie as sources of heat in his experiments on the radiating power of surfaces.

**Lespedeza.** Genus of leguminous plants, of which one species, *L. striata*, or Japan Clover, is an important forage plant, especially in the Southern States. It is an annual, but seeds so readily and abundantly that the land becomes self-sown and with proper care will produce a crop from year to year without artificial sowing. It furnishes an abundant crop of forage, similar in composition to clover and alfalfa, and hence nutritious and palatable.

**Lespinasse,** CLAIRE FRANCOISE, ab.1731–1776. Head of a Parisian salon frequented by the Encyclopedists. *Lettres*, 1809–87.

**Lesquereux,** LEO, 1806–1889. French bryologist and paleobotanist, in the U. S. from 1848. *Les marais tourbeux*, 1844; *Catalogue des mousses de la Suisse*, 1845; *Fossil Plants*, 1858–74; *Tertiary Flora*, 1877; *Coal Flora*, 1880–84.

**Lesseps,** FERDINAND, VICOMTE DE, 1805–1894. French financier; projector and director of the Suez Canal, constructed 1860–69; Pres. Panama Canal Co., which failed disastrously 1888.

**Lessing,** GOTTHOLD EPHRAIM, 1729–1781. German dramatist and critic. His plays, *Minna von Barnhelm*, 1767, *Emilia Galotti*, 1772, and *Nathan der Weise*, 1779, advanced the national drama to a high degree of perfection. He began his career, 1758, as critic in the *Literatur-Briefe*, and in the *Laocoon*, 1766, carried criticism to a point never surpassed. His *Hamburgische Dramaturgie*, 1769, contains a vast fund of critical knowledge on dramatic subjects. He overthrew French classicism, and established German literature on a firm foundation. His position in philosophy is shown by the famous maxim, "If God offered Truth in His right hand and the spirit of truth in the left, I would choose the left."

Gotthold Ephraim Lessing.

**Lessing,** KARL FRIEDRICH, 1808–1880. German landscape painter, in his field next to the Achenbachs.

**Lessons.** Portions of Scripture appointed to be read during service in the Roman, Anglican, and P.E. churches.

**L'este.** East wind on the island of Madeira, corresponding closely to the Le Veche in Spain.

**Lester,** CHARLES EDWARDS, 1815–1890. American author; Consul at Genoa 1841–47.

**Lestocq,** JEAN HERMAN, 1692–1767. Surgeon to Peter and Elizabeth of Russia; active in public affairs; twice banished.

**L'Estrange,** SIR ROGER, 1616–1704. English royalist, imprisoned 1644–48; licenser of the press 1660; journalist, pamphleteer, and translator; knighted 1685.

**Le Sueur,** EUSTACHE, 1617–1655. French religious painter; an inferior painter, raised to prominence by the poverty of French art in his time.

**Le Sueur,** JEAN FRANCOIS, 1763–1837. Prof. Paris Conservatory of Music 1795–1802 and 1817; director of Napoleon's orchestra 1804; composer of operas and masses. *La Caverne*, 1793.

**Letcher,** JOHN, 1813–1884. M.C. 1853–59; Gov. of Va. 1860–64.

**Lethe.** In Greek Mythology, river of oblivion, in the under-world.

**Leto.** See LATONA.

**L'Etoile,** CLAUDE DE, 1597–1652. French playwright, poet, and Academician.

**Letronne,** JEAN ANTOINE, 1787–1848. Prof. Coll. de France 1831; writer on geography, history, art, and antiquities. *Works*, 6 vols., 1885.

**Letter of Credit.** Written authority to another to part with property or incur an obligation to a third person on the credit of the writer. No prescribed form is necessary.

**Letters Rogatory.** Judicial order for the deposition of a witness who is in another jurisdiction.

**Letters Testamentary.** Written instruments, duly issued by a probate judge or court, authorizing the executor to administer upon the testator's estate. They generally have no validity outside of the State in which they are granted. In intestacy, letters of administration are issued.

**Lettish.** Language, with Lithuanian and Old Prussian, closely related to the Slavonic tongues; branch of the Aryan family.

**Letts.** Branch of the Lithuanian race, living in s. Livonia, Courland, Vitebsk and the n. of Kovno, Russia, numbering about 1,200,000. They belong mostly to the Lutheran and Greek Churches.

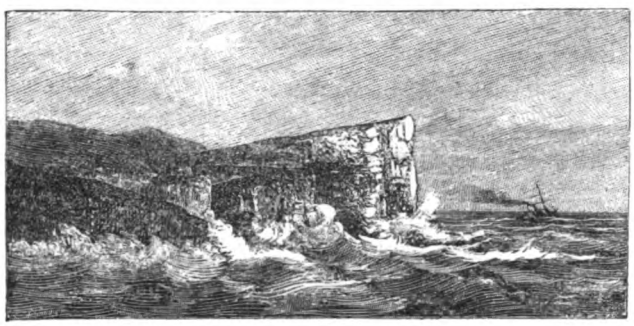
**Lettuce.** *Lactuca sativa.* Tall succulent herb of the Composite family, apparently native of Asia; widely cultivated for salad, in numerous varieties. The milky juice is narcotic.

**Lettuce,** BLUE. Some N. American species of the genus *Lactuca*, natural family *Compositæ*.

**Lettuce,** FALSE. Species of *Lactuca* of the section *Mulgedium*, natives of e. N. America.

**Lettuce,** WHITE. See RATTLESNAKE-ROOT.

**Leucadia,** or LEUKAS. Now Santa Maura; Greek island



Cape Ducato, Santa Maura.

in the Ionian Sea, adjoining Acarnania; long held by Venice from 1684. Area 110 sq. m.; pop. ab. 25,000.

**Leucaniline.** $C_{20}H_{21}N_3$. Triamidodiphenyltolyl methane; made from the corresponding nitro-compound. On oxidation it yields rosaniline.

**Leucine.** $CH_3.(CH_2)_3.CH.NH_2.COOH$. $\alpha$-Amidocaproic acid; found in the spleen, pancreas, and brain, and to some extent in certain vegetables; constant product of the digestion of albumen in the small intestine.

**Leucippus,** ab. 500 B.C. Founder of the atomic theory in Greek philosophy, in connection with Democritus.

**Leucite.** $KAlSi_2O_6$. Potassium aluminium silicate. Allied in some respects to feldspar, occurring in crystals that resemble the tetragonal trisoctahedron of the isometric system, though exhibiting abnormal optical properties; commonly found in connection with volcanic rocks of recent geological age.

**Leucites.** See LEUCOPLASTIDS.

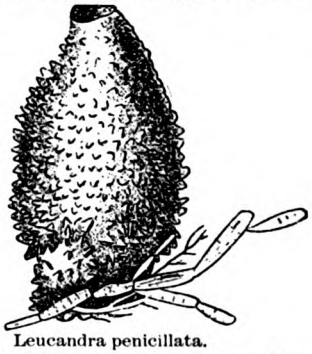
**Leuckart,** CARL GEORG FRIEDRICH RUDOLF, b. 1823. Prof. of Zoölogy at Giessen 1850 and Leipzig 1869; specialist on entozoa, as in *Trichina Spiralis*, 1861, and *Parasiten*, 1861–66.

**Leuco Compounds.** Colorless compounds resulting from the action of hydrogen or other reducing agent upon organic coloring matters, Fuchsine, indigo, safranine, etc., furnish them.

**Leucocythæmia.** Disease in which the number of white blood corpuscles is increased and that of the red decreased, causing, in severe cases, paleness, trouble with digestion, vertigo, enlarged spleen and lymphatic glands, palpitation of the heart and great weakness. It is due to disease of the spleen, marrow or lymphatic glands. Remedies which improve the general health usually afford relief, but often nothing can be done.

**Leucomaines.** Nitrogenous bases or alkaloids developed by living organisms during digestion, excretion and other vital processes. Some are harmless, while others are poisonous.

**Leuconidæ** (LUECONES). Calcareous sponges with thick walls pierced by branching canals. The form of the body is



Leucandra penicillata.

Sycandra ciliata.

sac-like, and there is but one osculum. The flagellated cells are in special dilatations of the canals.

**Leuconostoc.** See COCCUS BACTERIA.

**Leucophyll.** Colorless substance developed in the cells of plants grown in the dark, which gives rise to chlorophyll when natural conditions are restored.

**Leucoplastids.** Colorless protoplasmic granules, generally somewhat spindle-shaped, occurring in vegetable cells in parts not subjected to light, as tubers and bulbs. They are the bodies around which starch grains are formed, and hence known as amylogenic bodies; also called Leucites.

**Leucopyrite.** $Fe_3As_4$. Iron arsenide, resembling arsenopyrite.

**Leucorrhœa** (WHITES). Muco-purulent discharge from the vagina, caused as a rule by affections of the mucous membrane of the vagina or uterus.

**Leuctra.** Village in Bœotia, scene of a memorable defeat of Spartans by Thebans under Epaminondas, 371 B.C.

**Leuret,** FRANÇOIS, 1797–1851. French alienist, director of the hospital Bicêtre. *Traitement moral de la Folie*, 1840–46.

**Leuthen,** BATTLE OF. Dec. 5, 1757; victory of Frederick the Great over a larger Austrian force under Prince Charles of Lorraine.

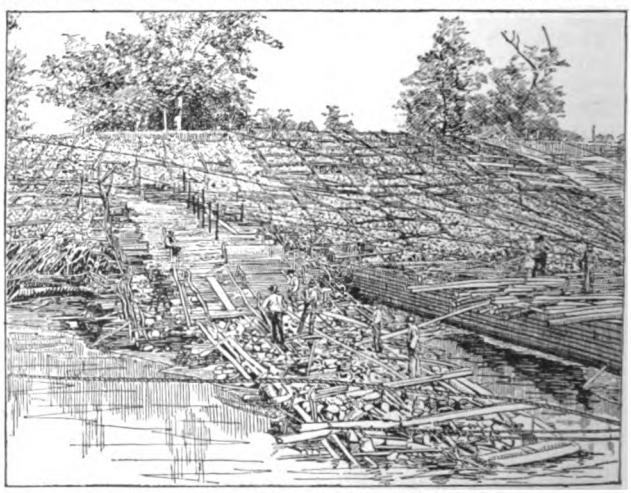
**Leutze,** EMANUEL, 1816–1868. N. A. 1860. German-American painter. His *Westward Ho* is on the staircase of the Capitol at Washington. *Washington Crossing the Delaware* was by him.

**Levaillant,** FRANÇOIS, 1753–1824. French writer on Africa, 1790–96, and its birds, 6 vols., 1798–1812. *Parroquets*, 1801–5.

**Levant.** Regions bordering on the e. Mediterranean, especially those held by Turkey.

**Le Veche.** Dry hot wind from the s.e., s., or s.w., on the Mediterranean coasts of Spain; similar to the scirocco in Italy; usually loaded with fine sand and dust, producing violent headaches, and prostrating the most robust. It extends inland 40 or 50 miles, and is especially severe on the central s.e. coast.

**Levees.** Dikes built along a river to protect the land from inundation. They are built of earth faced with stone or with brush mattresses loaded with stone. The levees and em-

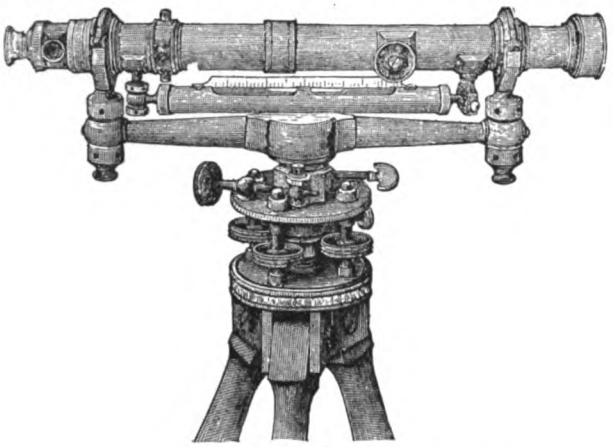


Levee Construction on the Mississippi River.

bankments in Holland have cost $1,500,000,000. The banks of the Mississippi River have nearly continuous levees south of Memphis, about $40,000,000 having been expended since 1862.

**Level.** A surface when every point of it is equally distant from the center of the earth. It is therefore not a plane surface. The surface of a mass of liquid acted on only by gravity tends always to be level.

**Level.** Surveyor's instrument for running lines of levels. The illustration shows the Y level generally used in the U.S.



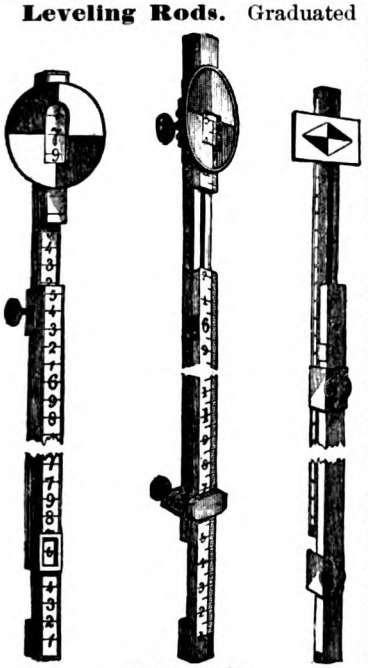
Level.

The level bubble is parallel to the line of sight of the telescope: by looking through the latter a level line is determined.

**Level.** In mining, horizontal passage following the strike of a vein.

**Leveling.** Measurement of the heights of mountains above sea level, sometimes called Hypsometry. There are four methods: (1) by the temperature of boiling water, (2) by the barometer, either aneroid or mercurial, (3) by vertical angles, and (4) by spirit levels. The first method is lacking in precision and is no longer used; the second and third will determine heights within a few feet if great care be taken; the fourth is the most precise but the most expensive. The mercurial barometer is preferable to the aneroid because the latter is affected by the change in the force of gravity. Vertical angles can only be used in connection with a triangulation which gives the horizontal distances between the stations, and the refraction of the air must be taken into account. Spirit leveling is done by an engineer's level and rod; the probable error of the best work of this class is less than 0.02 ft. multiplied by the square root of the distance in miles; thus for two points 100 miles apart the probable error in difference of height is less than 0.2 ft.

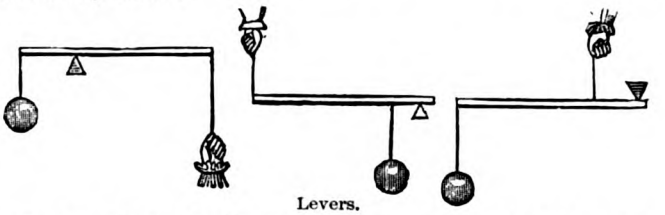
**Leveling Rods.** Graduated rods with targets, used in leveling operations. The kinds most commonly used in the U. S. are the Phila., the New York, and the Boston, shown in the figure.



Leveling Rods.

**Lévêque,** Jean Charles, b. 1818. Prof. of Philosophy in Coll. de France 1856. *La Science du Beau; Harmonies*, 1872.

**Lever.** One of the elementary machines. A bar or beam rests upon a point of support called a fulcrum. The power is applied at one point of the bar, and the resistance to be overcome acts at another point. When the fulcrum is between power and resistance, the lever is of the first order; when the fulcrum is at one end, and the resistance is between fulcrum and power, of the second order; when the fulcrum is at one end, and the power between fulcrum and resistance, of the third order. The distance from the fulcrum to the point of application of power or resistance is called its lever-arm. The product of power into its lever arm always is equal to the product of resistance into its lever arm, and the power multiplied into its path always equals the resistance into its path. This is the most used of elementary machines, and appears in every crank and every wheel.



Levers.

**Lever,** Charles James, M.D., 1806–1872. Irish novelist; ed. *Dublin Univ. Mag.* 1842–45; Vice-consul at Spezzia 1852–67, Consul at Trieste 1867. His first books, as *Harry Lorrequer*, 1840, *Charlie O'Malley*, 1841, *Arthur O'Leary*, 1844, were full of rollicking humor and very popular; those of his later years, as *The Martins of Cro' Martin*, 1856, and *Luttrell of Arran*, 1865, are far more serious.

**Leverage.** Length of a lever from the fulcrum to the point where the force is applied. See Lever.

**Leverrier,** Urbain Jean Joseph, 1811–1877. French astronomer, who pointed the way to discovery of Neptune 1846; Academician 1846; director of Paris Observ. 1854–70, and from 1873.

**Le Vert,** Octavia (Walton), ab. 1810–1877. American author. *Souvenirs*, 1858.

**Lever-Wood.** See Hop-hornbeam.

**Levi.** Third son of Jacob, and ancestor of the priestly caste of Israel, which, as not having a distinct territory, was not counted among the twelve tribes, that of Manasseh, the postponed-elder son of Joseph, taking its place.

**Levi,** Leone, 1821–1888. B. in Italy; prof. King's Coll., London, 1852. *Commercial Law*, 1850–64; *Hist. British Commerce*, 1872; *War*, 1881; *Wages*, 1885.

**Leviathan.** Idealization of aquatic life in Job xli., apparently founded on the crocodile. In Psalm civ. 26 it seems to mean the whale, in Isaiah xxvii. 1, a great snake.

**Levirate Marriage.** Hebrew law by which a man was bound to marry his brother's childless widow, and to account his first son the son of the deceased.

**Levirostres.** Tribe of clamatory Passeres, with gressorial or fissate feet adapted to clinging to branches. The beak is large but light, the legs short and weak. Here are included Hornbills (*Buceros*), with a horn-like outgrowth at the base of the beak; Kingfishers (*Halcyonidæ*), with long, keeled, angular beak, short wings and tail; and Bee-eaters (*Merops*), with compressed beak gently curved downward. The two outer toes are united nearly to the ends in the two last groups; hence they are sometimes termed the *Syndactyli*.

**Levita,** Elias, 1472–1549. German-Italian Jew, grammarian, lexicographer, and commentator.

**Levites.** Descendants of Levi; later, those not of priestly family.

**Leviticus.** Third book of O. T., containing detailed rites of Israelitish ceremonial worship. Its authorship is disputed.

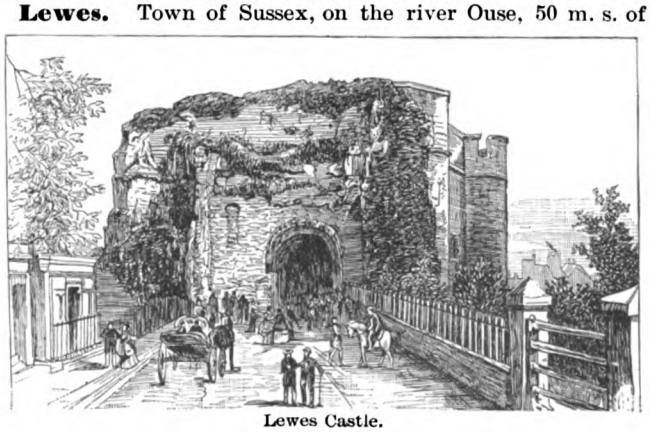
**Levulinic Acid.** $C_5H_8O_3$. Mpt. 33° C. Acid resulting from the action of nitric acid or other oxidizing agent on sugar, cellulose, starch, and other carbohydrates; colorless prisms, used in cotton-printing.

**Levy,** Maurice, b. 1838. French engineer, prof. Paris.

**Levynite.** $CaAl_2Si_3O_{10}+5H_2O$. Hydrous calcium aluminium silicate, found in Iceland and elsewhere associated with basaltic rock.

**Lewald,** Fanny (Mme. Adolf Stahr), 1811–1889. German novelist. *Diogena*, 1847; *Stella*, tr. 1884.

**Lewes.** Town of Sussex, on the river Ouse, 50 m. s. of



Lewes Castle.

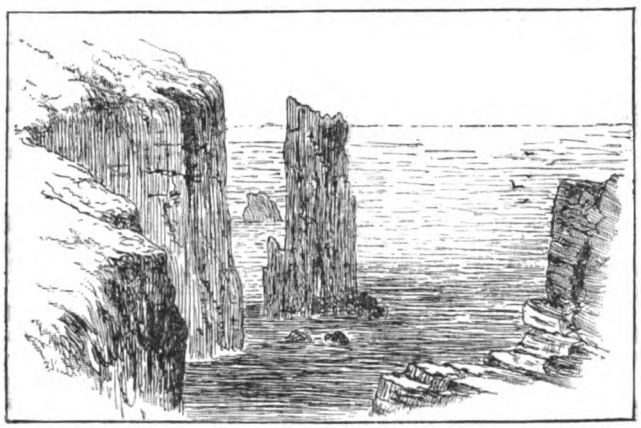
London. Its principal trade is in grain, sheep and cattle. An ancient town and seat of a Roman camp. Here Montfort defeated Henry III., May 14, 1264. Pop., 1891, 10,997.

**Lewes,** George Henry, 1817-1878. English author, in sympathy with the tenets of Comte, Mill, and Spencer. *History of Philosophy*, 1845; *Life of Goethe*, 1855; *Aristotle*, 1864; *Actors and Acting*, 1875; *Problems of Life and Mind*, 5 vols., 1874-79. His connection with George Eliot began 1854, and exerted great influence on both.

**Lewis.** Tool for lifting blocks of stone; consisting of wedge-shaped pieces of metal set in a hole in the block.

**Lewin,** Thomas, 1805-1877. English barrister. *Law of Trusts*, 1842; *St. Paul*, 1851-74; *Jerusalem*, 1861-63; *Fasti Sacri*, 1865.

**Lewis.** Largest of the Hebrides. Barley and potatoes are its principal crops. Its coasts are rough and ragged; its northern promontory is especially wild, marked by steep precipices and prolonged by isolated rocks into the sea. Stornoway is the principal town. Area 770 sq. m. Pop. ab. 30,000.



The Butt of Lewis.

**Lewis,** Andrew, ab. 1720-1781. Brig.-gen. of Va. troops 1774, of Continentals 1776. He defeated the Shawnees on the Kanawha Oct. 10, 1774, and repulsed Gov. Dunmore on the Chesapeake July 9, 1777.

**Lewis,** Dio, M.D., 1823-1886. American teacher, lecturer, and writer on hygiene. *Weak Lungs*, 1863; *Our Girls*, 1871.

**Lewis,** Estelle Anna (Robinson), 1824-1880. American poet. *Sappho*, 1868.

**Lewis,** Francis, 1713-1802. Delegate to Congress from N. Y. 1775-79; signer of the Declaration of Independence.—His son, Morgan, 1754-1844, was a revolutionary officer, Chief-justice of N. Y. 1792, Gov. 1805-6, and Major-gen. 1813.

**Lewis,** Sir George Cornewall, 1806-1863. M.P. 1847-52 and from 1855; ed. *Edinburgh Review* 1852-55; Chancellor of the Exchequer 1855-58; Home Sec. 1859-61; Sec. for War 1861. *Romance Languages*, 1835; *Authority in Matters of Opinion*, 1850; *Credibility of Roman History*, 1855.

**Lewis,** Henry Carvill, 1853-1888. Assistant on 2d Pa. Geological Survey; prof. Haverford Coll. 1883; prominent as a student of mineralogy and of glacial phenomena. His chief work was on the Drift in N. America and Europe.

**Lewis,** Ida, b. 1841. Life-saver off Newport, R. I., in the manner of Grace Darling.

**Lewis,** John Frederick, 1805-1876. English painter, R.A. 1865.

**Lewis,** John Travers, D.D., LL.D., b. 1825 in Ireland. Bp. of Ontario 1861, Abp. 1893; projector of the Lambeth Conference.

**Lewis,** Matthew Gregory, 1775-1818. English novelist and dramatist. *The Monk*, 1795; *Bravo of Venice*, 1804; *Journal of a W. India Proprietor*, pub. 1834.

**Lewis,** Meriwether, 1774-1809. Captain U.S.A.; explorer, with Capt. Wm. Clarke, of the then unknown West 1803-6; Gov. of La. 1807.

**Lewis,** Tayler, LL.D., 1802-1877. Prof. Univ. N. Y. 1838, Union Coll. 1849. *Six Days of Creation*, 1855.

**Lewis,** William Bryan, b. 1847 in Australia. Alienist. *Mental Diseases*, 1889.

**Lewis River.** See Snake River.

**Lewiston.** City of Maine, on the Androscoggin, founded 1770. It has extensive manufactures of cotton goods. Pop., 1890, 21,701.

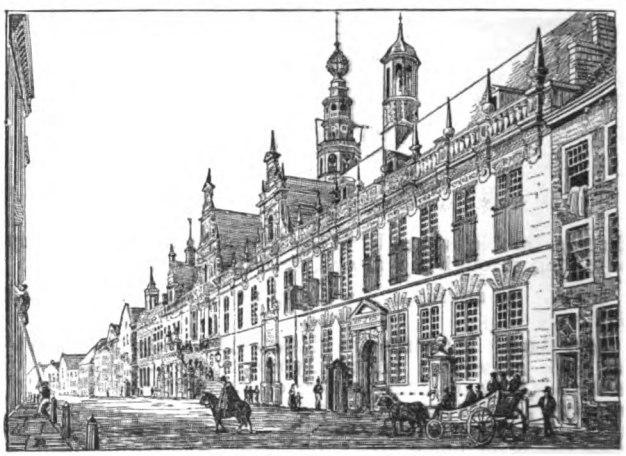
**Lexington.** Capital of Fayette co., Ky., on Town Fork of Elkhorn River, in the Blue-grass region; founded 1775; site of the State Univ. Pop., 1890, 21,567.

**Lexington.** Village of Mass., 11 m. w. of Boston. See Concord.

**Lexington.** Capital of Lafayette co., Mo.; taken by Confederates under Gen. Price Sept. 20, 1861, and Oct. 1864.

**Lex Talionis.** Law of retaliation. The punishing of an injury by the infliction of a similar injury; *e.g.*, eye for eye, tooth for tooth. In modern times, the infliction of like acts by one nation upon another.

**Leyden.** The ancient Lugdunum Batavorum; city of s. Holland, on a branch of the Rhine, 17 m. n. of Rotterdam; once noted for its cloth manufactures. Its university, founded 1575 in commemoration of its siege, defense, and relief, 1573-74, has ab. 50 instructors, 800 students, and a library of 160,000 vols. and 5,400 MSS. Pop., 1889, 46,379.



The Town-Hall, Leyden.

**Leyden,** Ernst Victor, b. 1832. Medical prof. at Königsberg 1865, Strassburg 1872, and Berlin 1876; writer on the spine and its diseases, 1864-74.

**Leyden,** John, 1775-1811. Scottish poet, in India from 1803.

**Leyden,** Lucas von, 1494-1533. Dutch painter, to whom it has been customary to attribute any picture of his time and country for which there was no other sponsor; a fine artist, whose pictures are extremely rare.

**Leyden Jar.** Discovery of Cunæus, 1745. It consists of a glass jar or bottle, coated for ab. two-thirds the way to the top inside and out with tinfoil. A wire in contact with the inner coating passes through an insulating cover and terminates in a metal ball. The jar acts as an electric condenser, and is charged by connecting the outside with the ground or one of the main conductors of an electrical machine, and the inside with the other conductor: thus the two sides receive opposite charges, the glass acting as the dielectric. The capacity of a Leyden jar is given by the formula

$$C = K \frac{S}{4 \pi t},$$

in which K is the specific inductive capacity of the glass, S the surface of the foil, and t the thickness of the dielectric.

**Leyden Museums.** There are two. The Ethnographical Collections form one, and have no rival in the world for the Malay Archipelago. The Egyptian Museum is one of the best in Europe.

**Leypoldt,** Frederick, 1835-1884. B. in Germany; publisher and bibliographer in New York.

**Leys,** Henri Jean Auguste, 1815-1869. Belgian painter, Baron 1862.

**Ley's Law.** Of the vertical succession of upper currents; announced 1872 (but by Abbe 1871), according to which, as we in the n. hemisphere ascend in the air, the direction of the wind is from a point more and more to the left; *i.e.*, as we ascend, the wind appears to veer.

**Leyte.** One of the Philippine Islands. Area 3,440 sq. m.; pop. ab. 275,000.

**Lhassa,** or Lassa. Capital of Thibet; on the Kichu, 11,600 ft. above tide; sacred city of the Buddhists, residence of the

Dalai lama, and place of pilgrimage. Very few foreigners are allowed to enter it. Pop. ab. 25,000.

Lhassa, in the 17th century.

**L'Heriter de Brutello,** CHARLES LOUIS, 1746–1800. Fellow of the Paris Institute. French botanist. *Geraniologia*, 1787–88; *Stirpes novæ*, 1784–85; *Cornus*, 1788.

**L'Hermitte,** LEON AUGUSTIN, b. 1844. French painter.

**L'Hopital,** MICHEL DE, 1504–1573. Treasurer of France 1554; Chancellor 1560–68; a moderate, far-seeing, and wide-minded statesman, perhaps the first to insist on religious toleration.

**Li.** Chinese mile; $27\frac{1}{5}$ li being equal to 10 miles: also Chinese weight, being equal to $\frac{1}{1000}$ ounce.

**Liability Acts.** See JOINT and SEVERAL LIABILITY and LIMITED LIABILITY.

**Lian Fong,** GULF OF. Arm of the Yellow Sea, extending into China.

**Lias.** Lowermost Jurassic beds of England, consisting mainly of grayish limestone containing marine fossils and especially characterized by Ammonites.

**Libanius,** ab.314–ab.396. Pagan rhetorician at Constantinople; teacher and friend of Basil and Chrysostom. He left many orations and letters.

**Libation.** Drink-offering to the Lares or other ancient deities, usually before meals.

**Libby Prison.** Storehouse in Richmond, Va., in which many Union soldiers captured by Confederates 1861–64 were confined.

**Libel.** 1. First pleading in admiralty or ecclesiastical proceedings. 2. Defamatory utterance in print or by other permanent visible signs. It subjects the utterer to a civil and a criminal action, unless published upon a privileged occasion or its truth is established.

**Libellulidæ** (DRAGON-FLIES). Of the tribe *Amphibiotica* of the *Pseudoneuroptera*. They are large, slender insects, with movable head, short antennæ, and four large, net-like, latticed wings. The mouth parts are well developed. The sexes are often of different colors. The larva lives in water, and has gills in or near the rectum. Its lower lip is modified to form an apparatus for catching prey. These insects are sometimes considered as forming the order *Odonata*.

Libellulidæ.

**Libelt,** KAROL, 1807–1875. Polish author and patriot, imprisoned 1846–48. *System of Philosophy*, 1850; *Æsthetics*, 1849–54.

**Liber.** See ENDOPHLŒUM and BAST.

**Liberals.** English party which succeeded the Whigs; opposed to the Conservatives or former Tories; long led by Gladstone.—In general, persons professing opposition to narrow orthodoxy or repressive conservatism.

**Liberal-Unionists.** Seceders from the Liberal party 1886, as opposed to Home Rule for Ireland. Led by Chamberlain and Lord Hartington, they have since acted with the Conservatives and held cabinet positions with them.

**Liberia.** State of w. West Africa, extending ab. 600 m. on the Guinea coast; founded 1822 by the American Colonization Society. Pop., 1891, 1,068,000, of whom 18,000 derived their descent from America. The government is patterned after that of the U. S. Capital, Monrovia.

**Liberius,** ST., d. 366. Bp. of Rome 352, banished 354, restored 357; opponent of Arianism. His day is Aug. 27, and in the East Sept. 23.

**Libertines.** 1. Jewish freedmen, enemies of St. Stephen (Acts vi. 9). 2. Dutch Antinomians, ab. 1550. 3. Similar sect at Geneva, who opposed Calvin's reforms.

**Liberty.** 1. Civil; freedom from undue interference with one's person or property. 2. Personal; freedom of proper personal action. 3. Political; freedom to take part in the conduct of political affairs. 4. Religious; freedom of religious belief, discussion and worship.

**Liberty,** CAP OF. Felt caps were worn at Rome by manumitted slaves, and during the Saturnalia by all the people. The *bonnet-rouge* was the badge of the French revolutionists 1793. The cap is sometimes used to crown a liberty-pole.

**Liberty Bell.** Cast in London and received in Phila. Aug. 1752; recast 1753. It announced the Declaration of

Liberty Bell.

Independence July 8, 1776, was cracked 1835, was exhibited at Chicago 1893, and is in Independence Hall, Phila.

**Liberty, Equality, Fraternity.** Motto of the French Republic 1793 and since.

**Liberty of the Press.** See PRESS.

**Libethenite.** $4CuO.P_2O_5.H_2O$. Hydrous copper phosphate, named from Libethen, in Hungary, where it occurs associated with chalcopyrite.

**Libitina.** Ancient Italian divinity, who had to do with corpses and burial. At her temple in Rome the death-registers were kept, and everything necessary for funerals.

**Libra.** See ZODIAC.

**Library.** Collection of books belonging to a private person, community, public institution or joint-stock company, also the repository of such a collection. Pisistratus founded at Athens the first public library ab. 540 B.C. The second of note was founded by Ptolemy Philadelphus 284 B.C. It was partially destroyed when Cæsar set fire to Alexandria 47 B.C. (see ALEXANDRIAN LIBRARY). Aristotle, according to Strabo, had the first private library, 334 B.C. The following table gives all the libraries in the world containing 500,000 or more volumes:

| Library. | City. | No. of Vols. |
|---|---|---|
| 1. National | Paris | 2,600,000 |
| 2. British Museum | London | 1,650,000 |
| 3. Imperial | St. Petersburg | 1,070,000 |
| 4. Munich | Munich | 1,000,000 |
| 5. Berlin | Berlin | 850,000 |
| 6. Strasburg | Strasburg | 700,000 |
| 7. Library of Congress | Washington | 680,000 |
| 8. Public | Boston | 597,000 |
| 9. Public | Vienna | 570,000 |
| 10. Darmstadt | Darmstadt | 556,000 |
| 11. Leipzig | Leipzig | 550,000 |
| 12. Bodleian | Oxford | 530,000 |
| 13. Royal | Copenhagen | 500,000 |
| 14. Public | Stuttgart | 500,000 |

Nos. 6 and 7 are given exclusive of pamphlets.

**Libration.** Apparent oscillation of the moon, in consequence of which its hemisphere turned toward the earth is not always precisely the same. There are three principal librations, diurnal, in latitude, and in longitude.

**Libration,** DIURNAL. Due to change in the observer's position, caused by the earth's rotation. Thus, when the moon is in the e. horizon, we view it from a point which may be 8,000 miles (the earth's diameter) distant from that occupied when it is in the w. horizon. We can in consequence see alternately a little further around one limb or the other.

**Libration in Latitude.** Due to the position of the moon's axis, which is not perpendicular to the plane of the orbit, the deviation from 90° being ab. 6° 30′. Accordingly, therefore, as the n. or s. pole is toward the earth, a slightly different aspect is presented.

**Libration in Longitude.** Due to the fact that the moon's angular motion in its orbit about the earth is not uniform, while the motion about the axis is so. As both revolutions take place in the same time, an apparent swinging of the moon results. The angle of this oscillation may amount to 7° 45′.

**Libretto.** Book of words of an opera; at first a pastoral poem with little action, but considerable poetical value; then, with the decadence of the lyric drama, sinking to the level of a mere verbal stalking-horse upon which music could be hung; and latterly, mainly through Wagner's influence, striving to rise to the level of a well-constructed, logically-developed drama, admitting of the employment of music as a means for raising the emotional power of words, scenery, and pantomime.

**Libri-Carrucci,** GUILLAUME TIMOLEON, COMTE DE, 1803–1869. Prof. Pisa 1823; in France 1830–50. *Histoire des Sciences Mathematiques en Italie*, 4 vols., 1838–41.

**Libriform Cells.** Prosenchyma cells of very small diameter.

**Liburnia.** N. district of Illyria, anciently famous for the skill of its sailors and the swiftness of their ships.

**Libya.** Anciently, Africa, or the desert w. of Egypt. Its people in remote antiquity were maritime, and warred with

An Oasis in the Libyan Desert.

Egypt. They were driven inland by the Carthaginians, and vanquished by the Romans.

**Libyan Language.** Dialects of the Hamitic family, spoken in n. Africa.

**Libyan Sea.** Anciently, that part of the Mediterranean between Crete, the Delta of the Nile, and Africa.

**Lice.** See ANOPLURA and PEDICULIDÆ.

**License.** 1. Private; permission by an individual or by the law to do what would otherwise be unlawful. It never creates an estate in property, and is personal. 2. Public; permission by the State to do an act or series of acts, otherwise unlawful, *e.g.*, to sell spirituous liquor. 3. Permission by one belligerent to trade with the other.

**License Tax.** Imposed by government on the permission given to an individual or corporation to follow a certain occupation or do certain acts; as the keeping of a hotel or liquor saloon, the sale of gunpowder, huckstering, or carrying a gun. It is sometimes laid for the sake of income to the government, sometimes to regulate the industry licensed and only subordinately for revenue.

**Licentiate.** 1. Possessor of a degree inferior to that of doctor, granted by French and German universities. 2. In some denominations, person authorized to preach, but not yet ordained.

**Licentius,** 5th cent. Latin poet of Africa, disciple of Augustine.

**Lichen.** Loose term which includes a large number of dry papular diseases of the skin.

**Lichenine.** Carbohydrate related to starch, found abundantly in certain lichens.

**Lichenology.** Study of lichens.

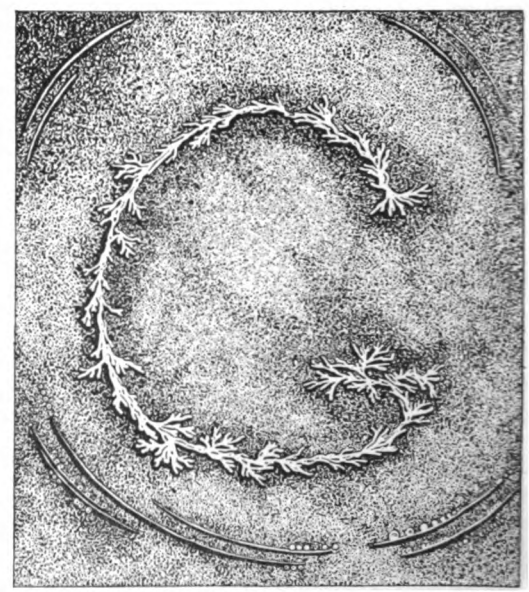
**Lichens.** Class of *Thallophyta*, growing in the most diverse situations, the great majority being terrestrial, and found on the earth, rocks, or trees. They are compound plants, resulting from a union and symbiosis of *Fungi* with minute *Algæ*.

**Lich Gate.** See LYCH GATE.

**Lichfield.** Town of Staffordshire, 118 m. n.w. of London; noted for its old cathedral, restored 1860–84, and as the birthplace of Dr. Johnson; besieged by Parliament's forces 1643. Pop., 1891, 7,864.

**Lichtenberg,** GEORG CHRISTOPH, 1742–1799. Prof. Göttingen 1770; physicist and astronomer. He satirized Lavater and others, and wrote in praise of Hogarth's engravings. *Works*, 14 vols., 1844–53.

**Lichtenberg's Figures.** Phenomenon illustrating the different electric conditions of the two coatings of a Leyden jar. Let two series of lines or figures be traced upon a cake of resin or vulcanite, one with the knob and the other with the



Lichtenberg's Figures.

outside coating of a charged jar; if now a mixture of red lead and flowers of sulphur be sifted over the cake, the sulphur will adhere to the positive lines and the red lead to the negative ones, since, in the process of mixing, the sulphur became negatively and the red lead positively electrified.

**Lichtenstein,** ULRICH, d. 1276. Austrian minnesinger.

**Licinianus,** GRANIUS, 2d cent. Roman historian, of whom fragments survive.

**Licinio,** or **Pordenone,** GIOVANNI ANTONIO, 1484–1540. Italian painter, mostly in fresco.

**Licinius,** LICINIANUS, 263–323. Roman emperor in the East; made Cæsar by Galerius 307; defeated by Constantine 315 and 323.

**Lick,** JAMES, 1796–1876. Financier of Cal., founder of the Lick Observatory.

**Licking River.** In Ky.; branch of the Ohio. Drainage area 3,658 sq. miles.

**Lictors.** Attendants of the higher magistrates in Rome, who bore a bundle of rods (fasces), from which an ax projected. The consul was preceded by 12, the dictator by 24.

**Liddell,** HENRY GEORGE, D.D., D.C.L., b. 1811. Prof. Oxford 1845, head master of Westminster School 1846, Dean of Christ Ch. 1855. With Dr. R. Scott he prepared an important *Greek Lexicon*, 1843–83. *History of Rome*, 1855.

**Liddon,** HENRY PARRY, D.D., D.C.L., 1829–1890. Canon of St. Paul's, London, 1870, Prof. Oxford 1870–82; foremost preacher of his time. His *Divinity of Our Lord* (Bampton Lectures), 1867, was greatly valued.

**Lidner,** BENGT, 1758–1793. Swedish dramatist and lyric poet.

**Lie,** JONAS LAURITZ IDEMIL, b. 1833. Norwegian novelist. *The Visionary*, 1870, tr. 1894; *The Bark "Future,"* 1872, tr. 1879; *The Pilot and his Wife*, 1874, tr. 1877; *Family at Gilje*, 1883; *Niobe*, 1893. His books are true to life and very popular.

**Lieber,** FRANCIS, LL.D., 1800–1872. German-American author; ed. *Encyc. Americana*, 1829–33; prof. S.C. Coll. 1835–56, and Columbia Coll. from 1856. *Political Ethics*, 1838; *Legal and Political Hermeneutics*, 1839; *Civil Liberty and Self-Government*, 1853; *Instructions for U. S. Armies*, 1863.—His eldest son, OSCAR MONTGOMERY, 1830–1862, did geological work in Ala. and S. C.

**Liebermeister,** KARL VON, b. 1833. Prof. Basel 1865, and Tübingen 1871; writer on pathology.

**Liebig,** JUSTUS, FREIHERR VON, 1803–1873. Prof. of Chemistry at Giessen 1824–52, where he built the first laboratory for instruction, and at Munich from 1852; Baron 1845; pre-eminent as an experimenter and teacher, and especially famous for

Justus Liebig.

applications of his science, as the beef extract and other prepared foods, whereby he was a universal benefactor. His chief works have been translated, as *Chemistry in its Application to Agriculture and Physiology*, 1840; *Animal Chemistry*, 1842; and *Letters on Chemistry and its Relations to Commerce*, 1844.

**Liebig's Condenser.** Device used in distilling small quantities of a liquid. It consists of a glass tube ab. 30 inches long, passing through a larger metal tube, which serves as a jacket through which a constant stream of cold water is made to pass. The vapor which is passed through the glass tube is thus condensed, and the liquid drops into a vessel placed to receive it.

**Liebling,** EMIL, b. 1851. American pianist and composer.

**Liebmann,** FREDERIK MICHAEL, 1813–1856. Danish botanist. *Mexico's Bregner*, 1849; *Mexico's Halogræs* (*Cyperaceæ*), 1850; *Les chênes de l'Amerique tropicale*, 1869.

**Liebrecht,** FELIX, 1812–1890. Prof. at Liége 1849–67; authority on folklore. *Zur Volkskunde*, 1879.

**Liebreich,** RICHARD, b. 1830. German oculist, practicing in Paris 1862–70, and since in London. *Atlas der Ophthalmoskopie*, 1863.

**Liége** (LÜTTICH). City of Belgium, on the Meuse; dating from ab. 650; destroyed by Charles of Burgundy 1467, after a revolt; taken by the French 1691 and 1792, and by Marlborough 1702. Several of its old churches are notable. The university, founded 1817, includes a polytechnic school, and has ab. 70 teachers, 1,200 students, a library of 110,000 vols., and a mu-

Town Hall and Market Place, Liege.

seum. The city adjoins rich coal mines, and has extensive manufactures, especially of fire-arms. Pop., 1892, 155,898.

**Liégeard,** FRANÇOIS EMILE STEPHEN, b. 1830. French poet and descriptive writer.

**Liegnitz.** City of Prussia on the Katzbach. Near it victories were won by Mongols 1241, Saxons 1634, Frederick II. 1760, and Blucher 1813. Pop., 1890, 46,874.

**Lien.** Claim on another's property as security. Its forms are various, and the methods of enforcing it differ.

**Lier,** ADOLF, 1826–1882. German landscape-painter, active at Munich.

**Lierne.** In Gothic vaulting an intermediate rib, often in English work, of no constructive significance.

**Lieutenant.** Officer junior in rank to a captain. The U.S. Service has two grades; both attached to a company of infantry, troop of cavalry, or battery of artillery.

**Lieutenant-Colonel.** Officer next in rank below a colonel, in whose absence he commands the regiment.

**Lieutenant-General.** Rank in the U.S. service above major-general and below general; held only by Washington, Scott (by Brevet), Grant, Sherman, Sheridan, and Schofield. Washington was thus commissioned July 3, 1798. Grant was promoted to this rank March 2, 1864, made General-in-Chief of U.S. armies March 9, and General July 25, 1866. Sherman became Lieut.-gen. July 26, 1866, and General March 4, 1869. Sheridan became Lieut.-Gen. 1869, and General June 1, 1888. After his death, Aug. 5, 1888, the office of General ceased to exist, but that of Lieut.-Gen. was recreated by Congress for Schofield Feb. 5, 1895.

**Life.** In general, all animated existence; specifically, either vital force, which is the supposed cause of all organic life, or the complex functions involved in the organization of living beings, whether animal or vegetable.—In Biology, the organizing principle or power, in matter or material forces. The activity of life is manifested by the operation of the material forces, but the morphology and the reaction of these forces in adaptation to the circumstances and stimuli of the environment are determined by life, as educated by experience in special ways. Development is to be explained as a series of intelligent reactions of life, expressed in gradually evolved structures under circumstances that call forth the series. See EPIGENESIS.

**Life Boat.** Boat with air-chambers or floats of cork, to give it great buoyancy and allow it to carry a load even when filled with water. The first patent was granted to Lionel Lukens in England 1785.

**Life Insurance.** See INSURANCE.

**Life Preservers.** Device for rendering the human body buoyant in water. They are principally made of cork in the form of jackets and belts, or of India-rubber cloth belts which are inflated. They were known to the early Romans, the messenger sent by Camillus to the Capitol swam the Tiber with a cork jacket. Merriman's life preserver is an air-filled waterproof suit. In this dress Paul Boynton crossed the British Channel in 23¼ hours. The U. S. law requires steamboats to carry a certain number of life preservers, proportionate to their passenger capacity.

**Life Rafts.** Carried on board ship to be used when boats

or other means are not available. The most common form is the catamaran life raft, consisting of two cigar shaped floats firmly bound together.

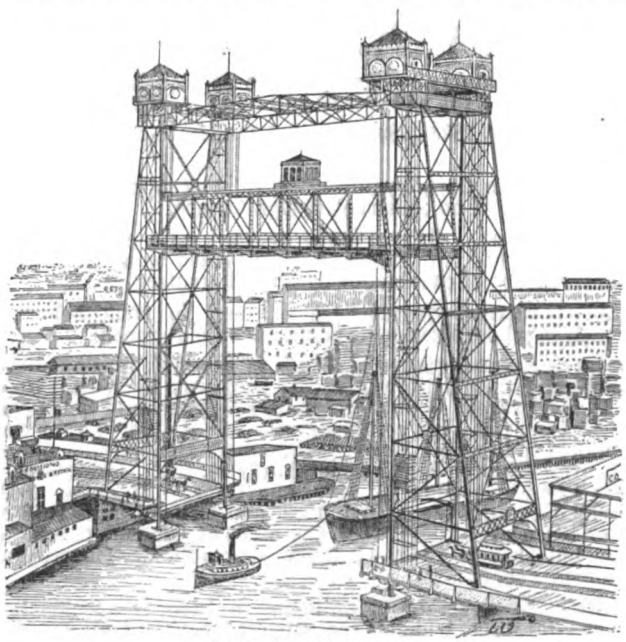
**Life Saving Service.** Institution organized 1848 in the U. S. for the saving of life in cases of wrecks upon its shores. Besides the Danish Government, the U. S. is the only one that has established a life-saving service, in other countries being sustained by private corporations. In China, benevolent societies have sustained one for centuries. In the U. S. stations are situated ab. 5 miles apart along the more dangerous parts of the coast, and are equipped with all modern life-saving apparatus. From 8 to 10 men are at each station, who patrol the coast in pairs from sunset till dawn, and in day time in thick weather, whose duty it is to be on the lookout for wrecks. The following table gives the statistics of the service for year ending June 30, 1895:

| | |
|---|---|
| Number of Disasters | 483 |
| Value of Property Involved | $10,647,235 |
| " " " Saved | 9,145,085 |
| " " " Lost | 1,502,150 |
| Number of Persons Involved | 5,402 |
| " " " Lost | 20 |
| " " Vessels totally destroyed on the U. S. Coast | 73 |

The cost of maintaining the service was $1,345,324.40.

**Lift.** In a coal mine, worked through a slope, portion included between two gangways at different levels.

**Lift Bridge.** Bridge with one end hinged so that it can



Lift Bridge, Chicago, Ill.

be lifted up to allow the passage of boats; or one which can be lifted bodily. See TOWER BRIDGE.

**Ligaments.** Strong elastic bands of fibrous tissue, which join together various structures of the body, especially bones and cartilages. They are found principally in the vicinity of joints, which they strengthen and hold together.

**Ligan.** Goods sunk at sea but identifiable by a buoy to which they are fastened.

**Ligation.** Tying of a thread, etc., around some part so tightly as to shut off its blood supply, or, as in the case of a blood vessel, to obliterate a canal or cavity. Ligatures may be of silver, silk, catgut, or some animal substance such as sinew, which is absorbed in a relatively short period.

**Light.** See RADIATION.

**Light and Air,** RIGHTS TO. Right which a man has to have the access of light and air to his windows from his own land. In some States a person, building up to his neighbor's line, may acquire such rights by 15 to 20 years' possession.

**Light Battery.** In U. S., field battery equipped with the 3.2 in. gun. It has six guns, with their limbers, caissons, a combined battery-wagon and forge, and an artillery wagon. When organized for instruction in time of peace it has 4 officers, 84 men, 66 horses, 6 guns, and 4 caissons; when for war, it has 5 officers, 175 men, 144 horses, 6 guns, and 9 caissons.

**Lighter.** Scow or raft, used for unloading vessels.

**Lightfoot,** JOHN, D.D., 1602–1675. English Hebraist. *Horæ Hebraicæ et Talmudicæ*, 1658–74.

**Lightfoot,** JOHN, 1735–1788. English botanist. *Flora Scotiæ*, 1777.

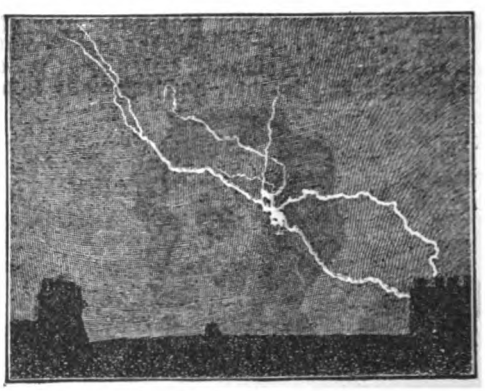
**Lightfoot,** JOSEPH BARBER, D.D., LL.D., D.C.L., 1828–1889. Bp. of Durham 1879; eminent biblical and patristic scholar; commentator on Gal., Phil., Col., 1865–75, Clement of Rome, 1869, Ignatius and Polycarp, 1885.

**Light-Horse.** Mounted soldiers lightly accoutered and armed so as to be available for scouting and active, desultory service; light dragoons, hussars, mounted riflemen, were formerly so designated.

**Lighthouse.** The Pharos, in the harbor of Alexandria, built 250 B.C., was 450 ft. high; the light was visible at 40 miles' distance. The Diamond Shoal lighthouse at Cape Hatteras, built in 1890, is 150 ft. high. Lighthouse construction demands the most perfect mansory foundations. Electric lights are now often used. The average annual expense of a lighthouse station in England is $1,500. The first lighthouse in the U.S. was erected in Boston harbor 1716. Since 1789 the general government has built and maintained all works of this description. A permanent Lighthouse Board was organized Oct. 1852. See EDDYSTONE.

**Light Infantry.** See INFANTRY, LIGHT.

**Lightning.** Discharge between oppositely electrified clouds or between a cloud and the earth. Three varieties are



From a Photograph of Lightning.

recognized, forked, sheet, and ball lightning. The light is almost always accompanied by thunder, the result of air commotion due to the passage of electricity.

**Lightning Arrester.** Device used in protecting telegraph instruments, telephones and dynamo-electric machinery from the passage of atmospheric electricity through the instruments. In one kind the line wire is connected to a brass plate separated by a thin layer of insulating material from another plate connected with the ground wire.

**Lightning Rods.** Metallic conductors intended to establish a definite line of least resistance between two bodies in opposite electrical states. The most important ancient notice of the relations between lightning and conducting metal appears to be that of Ctesias. The function of a lightning rod is twofold; first, that of conducting the charge to earth, and, second, the prevention of a disruptive discharge by silent neutralization of the cloud electrification. The latter explains why a rod should terminate in a point and likewise have good ground connection. It has been found that all exposed buildings should have lightning rods, especially if on hillsides, or near ditches which are full of running water. Houses in city blocks have no need of rods. Iron or copper conductors should be used, the latter weighing ab. 6 oz. to the foot and preferably in the form of tape. If iron is used, and it seems to be in every way as efficient as copper, it may be in rod or tape form and weighing ab. 35 oz. to the foot. The top of the rod should be plated with material which will not rust or corrode. Independent ground connections are preferable to gas or water mains. Linked conductors are of little use. Clusters of points are recommended along the ridge. There is no definitely protected area, though it has been claimed for a radius equal to the height of the points above the ground. In 1892 in U. S. lightning caused 839 fires, causing a loss on original risk of $2,921,484.

**Light Ratio.** For stars of different magnitudes. The light of a first magnitude star is equal to that of 100 of the 6th

magnitude. The light of a star of any given magnitude is nearly $2\frac{1}{2}$ times that of the next higher magnitude.

**Lights,** Use of, in Public Worship. Practice which prevailed in the Jewish and most of the ancient religions, and is now retained in the Roman and Oriental churches. An oil lamp always burns in a Roman Catholic church to indicate the presence of the Host.

**Ligne,** Charles Joseph, Prince de, 1735–1814. Belgian soldier, diplomatist, and author; Austrian field-marshal 1808. *Melanges*, 34 vols., 1795–1811. *Works*, 4 vols., 1860.

**Lignification.** Modification of the cell-wall of plants found in woody tissue, caused by the cellulose becoming incrusted with or changed into lignin.

**Lignin.** $C_{18}H_{24}O_{10}$?. Carbohydrate which causes the thickening of vegetable cell walls to form wood. Owing to the difficulty of separating it from cellulose its chemical composition has been found different by different observers. It is very easily decomposed by chemical agents. Wood usually contains ab. 50 per cent of lignin.

**Lignite.** See Coal.

**Lignose.** Incrusting material found with lignin.

**Lignum Vitæ.** *Guiacum officinale.* Tree of the natural family *Zygophyllaceæ*, native of tropical America, bearing blue flowers and pinnate leaves, and producing an exceedingly hard and durable wood, 33 per cent heavier than water, with an ultimate tensile strength of 11,000 lbs. per sq. inch; used for pulleys, etc.

**Ligny.** Village of Belgium, where Napoleon defeated the Prussians under Blücher, June 16, 1815, two days after the battle of Waterloo. The Prussians lost ab. 15,000 men while the French lost but 8,000.

Ruins of the Castle of Ligny.

**Ligonyi.** Mountain of e. Africa, w. of Lake Baringo. Altitude 14,000 feet.

**Ligroin.** Low-boiling and very volatile portion of the distillate obtained from crude petroleum. It consists of pentane and hexane, and is used as a solvent for organic compounds.

**Ligula.** Distal, more flexible part of the mentum in Insects; composed of the central ligula and lateral paraglossæ.

**Ligulatæ.** See Selaginellaceæ.

**Ligulate.** Strap-shaped ray-flowers of the natural family *Compositæ*.

**Ligule.** Thin and usually dry expansion from the leaves of grasses and other plants, at the junction of the blade and its sheath or its petiole.

**Liguliflorus.** Flower-head of plants of the Composite family when all the flowers are strap-shaped, as in the Dandelion and Lettuce.

**Liguori,** Alfonso Maria de, St., 1696–1787. Bp. of St. Agatha, Naples, 1762–75; founder of the Redemptorist order 1732; beatified 1816, canonized 1839; pronounced a doctor of the Ch. 1871. The chief of his numerous works is *Theologia Moralis*, 1753.

**Ligurian Republic.** Genoa; so named by Napoleon 1797, from the ancient name of the region; absorbed by France 1805. The Ligurians were apparently distinct from Iberians and Celts, but related to the Siculi.

Genoa.

**Li Hung Chang,** b. 1823. Viceroy of Chihli and Senior Sec. State 1870, Senior Sec. Foreign Affairs 1896. In 1864, as governor of the Thiang Sin province, he aided Gordon to suppress the Taiping rebellion. He visited Europe and U. S. 1896.

**Like Quantities.** In Arithmetic, those based upon the same immediate unit or of the same denomination; in Algebra, those differing only in numerical coefficients.

**Lilac.** Tall shrubs of the genus *Syringa* and natural family *Oleaceæ*, natives of Persia, widely planted for ornament, and occasionally escaped from gardens to roadsides in the U. S.

**Lilburne,** John, 1618–1657. English irreconcilable, whipped, fined, and imprisoned 1638; leader and model of the Levelers; tried 1649 for inciting the army to mutiny.

**Liliaceæ.** Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Monocotyledons*, comprising ab. 205 genera and 2,300 species, widely distributed throughout all parts of the globe; called the Lily family.

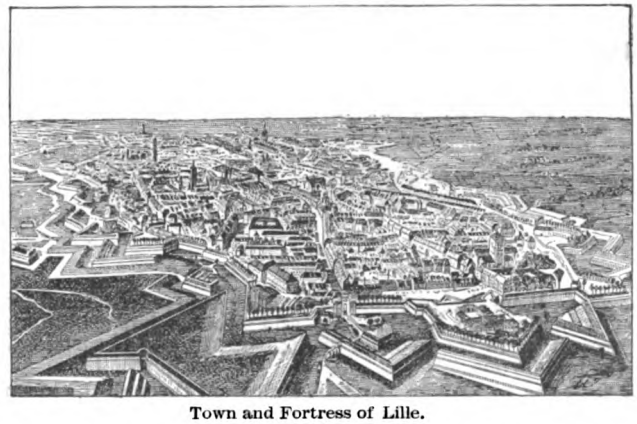
**Liliaceous.** 1. Flowers of plants of the Lily family (*Liliaceæ*) and some others, having a regular, six-parted perianth. 2. Relating to the Lily family.

**Liliencron,** Rochus, Freiherr von, b. 1820. Prof. Jena 1852–55; compiler and historian of German songs.

**Lilith.** In Talmudic legend, first wife of Adam; mother of demons.

**Liliuokalani,** b. 1838. Queen of the Sandwich Islands, Jan. 1891; deposed Jan. 1893.

**Lille.** Fortified city and military post of n. France; founded ab. 1020; held by Flanders, Burgundy, Austria, Spain, and since 1667 by France, except 1708–13; taken by Marlborough 1708 after three months' siege; attacked by Austrians 1792. It has extensive cotton manufactures, a R.C. college, and schools of music and art. Pop., 1891, 160,966; suburbs, 40,245.



Town and Fortress of Lille.

**Lilliput.** Fabulous kingdom, the inhabitants being the size of a finger; described in Swift's *Gulliver's Travels.*

**Lillo,** GEORGE, 1693–1739. English dramatist. *Fatal Curiosity*, 1736. *Arden of Feversham*, 1836; printed 1762. *George Barnwell*, 1732, was acted on Easter Monday and night after Christmas.

**Lilly,** WILLIAM, 1602–1681. English astrologer, supposed to have predicted the plague and fire of London.

**Lily.** Plants of the genus *Lilium;* showy-flowered, mainly bulbous, herbs of the natural family *Liliaceæ*, natives of the n. hemisphere.

**Lily,** ATAMASCO. *Zephyranthes atamasco.* Showy-flowered herb of the natural family *Amaryllidaceæ*, native of the s. U.S.

**Lily,** BLACKBERRY. *Gerumingia chinensis.* Red-flowered herb of the natural family *Iridaceæ*, native of Asia, introduced by cultivation into N. America.

**Lily,** DAY. Showy-flowered plants of the genus *Hemerocallis*, of the Lily family, natives of Europe, cultivated and introduced into the U.S.

**Lilye,** WILLIAM, ab. 1466–1523. English traveler, who learned Greek at Rhodes, and taught it in London; headmaster of St. Paul's School from 1510; writer of Latin verse.

**Lily of the Valley.** *Convallaria majalis.* Low herb of the Lily family, native of n. Europe and Asia, and of the higher mountains of the s. Alleganies; extensively cultivated.

Lily of the Valley.

**Lima.** Capital of Peru, 7 miles e. from Callao, its seaport; founded by Pizarro 1535. Its university, opened in 1551, is the oldest in America. L. has suffered often from earthquakes and insurrections; was taken by the Chilians 1821, 1838, and occupied by them Jan. 1881–Oct. 1883; is the chief commercial center of Peru. Pop., 1891, 103,556.

**Lima.** Capital of Allen co., Ohio; on the Ottawa; noted for the refining and shipment of oil. Pop., 1890, 15,981.

**Limacina.** See GYMNOSOMATA.

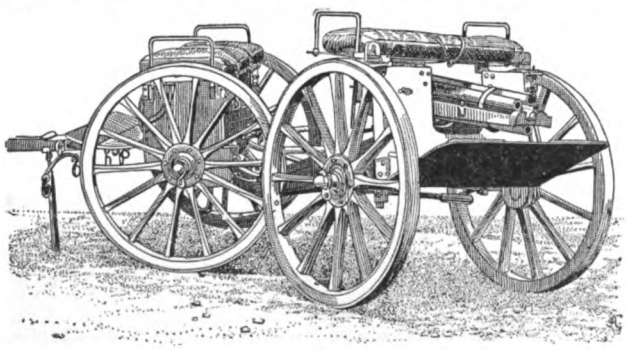
**Lima e Silva,** FRANCISCO DI, 1785–1853. Brazilian general, Regent 1831.—His son, LUIS ALVES, 1803–1880, was Prime Minister 1856–57, 1861–62, and 1875–78; Commander-in-Chief 1866–69, in the war with Paraguay; Duke of Caxias 1869.

**Limapontia.** See SACCOGLOSSA.

**Limax.** See STYLOMMATOPHORA.

**Limb.** In Botany, expanded or spreading portion of a gamopetalous corolla; also blade of a sepal or petal.

**Limber.** Two-wheeled carriage, which, when the gun trail is fastened to the pintle hook, makes a four-wheeled gun carriage. The horses are attached to the limber and draw it with



Limber.

the gun. It consists of two wheels, Archibald patent, mounted on a wrought steel tubular axle, and a limber box containing 42 projectiles in the two end compartments, and 44 cartridges in the middle one.

**Limbers,** or LIMBER HOLES. Holes cut through the lower part of a ship's floor timbers near the keel, forming a channel through which the water in the hold reaches the pump well.

**Limborch,** PHILIPP VAN, 1633–1712. Dutch Arminian, prof. Amsterdam 1668. *Inst. Theol. Christianæ*, 1686, tr. 1702; *Hist. Inquisition*, 1692, tr. 1731.

**Limbus,** or LIMBO. In Mediæval theology, intermediate state after death, wherein unbaptized infants remain, and O.T. worthies awaited Christ's resurrection.

**Lime.** Product of the calcination of limestone; a caustic, amorphous, infusible substance which possesses great avidity for water and is used to make common mortar. Hydraulic lime is a weak hydraulic cement which will slake when subject to water action. See CALCIUM OXIDE.

**Lime,** CHLORIDE OF. See BLEACHING POWDER.

**Lime Cartridge.** See CARTRIDGE.

**Lime Fruit.** *Citrus limetta.* Small tree of the Orange family, native of n. India, extensively cultivated in warm countries for its fruit, from which lime-juice is obtained.

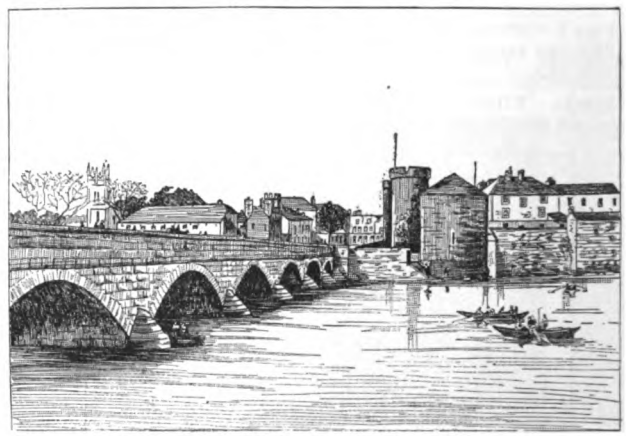
**Lime Kiln.** Pit in which limestone is burned to produce lime. An intermittent kiln is emptied periodically. A perpetual kiln is continually kept burning, the product being drawn off at the bottom as the limestone rock is added at the top.

**Lime Light.** See DRUMMOND LIGHT.

**Lime Mortar.** Made by mixing sand with common slaked lime: 16 bushels of sand and 3 of lime will make ab. 17½ of mortar, which is sufficient to lay ab. 1,000 bricks. Its crushing strength is ab. 200 lbs. per sq. inch.

**Lime,** SLAKED. Lime which has been treated with water. See CALCIUM OXIDE and HYDROXIDE.

**Limerick.** Town of s. Ireland, on the Shannon; founded by Danes ab. 850; taken by the English 1174 and 1651; be-



Limerick--Thomond's Bridge and King John's Castle.

sieged by William III. 1690; taken 1691. The treaty then arranged between the commanders was disregarded by Parliament. Pop., 1891, 37,072.

**Limes.** In Roman history, fortified boundary line, serving at the same time as a frontier-road.

**Limestone.** Rocks varying widely in structure and external appearance, but all consisting essentially of calcium carbonate, or of calcium and magnesium carbonates together (dolomitic). Some are crystalline (marble), others are fragmental, hard, and compact; some are plainly fossiliferous, others not; some are pure white, others, especially when impure, gray, blue, or nearly black. It is extensively used as a building stone and as a source of quicklime. Compare HYDRAULIC LIMESTONE, DOLOMITE, and CALCITE. Its ultimate compressive strength ranges from 1,500 to 7,500 lbs. per sq. inch, according to the quality of the specimen.

**Lime Tree.** See LINDEN.

**Lime Water.** Solution of calcium hydroxide, made by adding a large quantity of water to lime, allowing it to stand several hours, and then filtering. Used in medicine in cases of stomach troubles, arising from too much acidity of the intestinal juices.

**Limicolæ.** Oligochætous worms that live principally in the water. They have no segmental organs in the genital segments. The *Naidæ*, small transparent forms, are examples.

**Limicolæ** (LONGIROSTRES, SHORE-BIRDS). Section of *Grallæ*, including the Plovers (*Charadriidæ*), Snipe (*Scolopacidæ*), Avocets (*Recurvirostridæ*), and Oyster-catchers (*Hæmatopodidæ*).

**Liming.** The practice of adding lime to the soil is not so much to furnish plant food, since nearly all soils contain lime in abundance for the needs of the plant, as to induce chemical changes in the plant food already present, rendering it more available. The practice, if continued, without the addition of other fertilizers, must result in soil exhaustion sooner than if lime had not been applied. Its effects are most marked on soils containing a large amount of vegetable matter, and the lime should be applied as quicklime.

**Limit.** 1. That value which under its law a quantity must reach but cannot pass. 2. A value known to be larger (superior limit) or smaller (inferior limit) than any possible value of the quantity under the given law. 3. A constant value which a variable approaches and from which it can be made to differ never so little, but which it cannot reach. The last meaning is that of the Theory of Limits.

**Limitation of Actions.** Time, fixed by statute, within which an action must be brought for the enforcement of a right.

**Limited Liability.** Liability of members of a limited partnership or of a joint-stock company, falling short of the liability of ordinary partners, upon compliance with certain statutory requirements.

**Limiting Angle.** See FRICTION.

**Limiting Case.** Applied to forms of loci in which the given conditions are so related that the locus is transformed into one of a lower order; *e.g.*, two intersecting straight lines are a limiting case of the hyperbola.

**Limiting Index.** It was shown by Cauchy that the absolute refractive index of a medium might be expressed by the formula,

$$u^2 = A_1 + A_2 S^2 + A_3 S^4,$$

in which S is inversely proportional to the wave length in vacuum. As a consequence of this Prof. Powell pointed out that, as A diminishes, the wave length increases, the value of u approximates to a fixed limit given by the equation $u^2 = A_1$; which therefore defines the limit of the spectrum at the red end. u, as given by the equation $u^2 = A_1$, is called the limiting index. Langley has shown this conclusion to be incorrect.

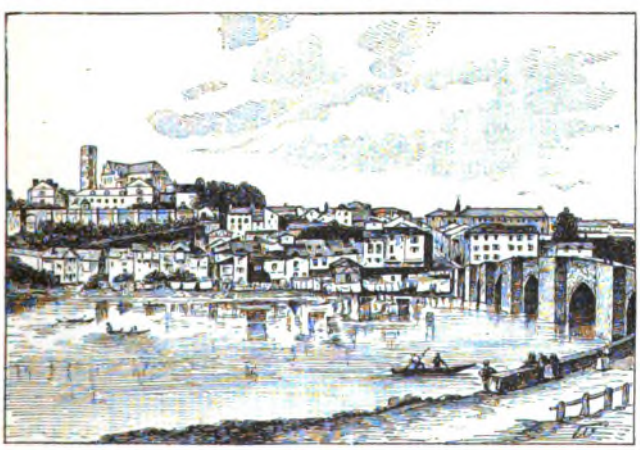
**Limiting Position.** This refers to auxiliary lines or planes related to any locus; *e.g.*, the tangent to a curve is the limiting position of a secant.

**Limits,** THEORY OF. Group of principles used in passing from measurements of rectilinear to those of curvilinear figures or from plane to curved solids; and as basis for the discussions and rules of the Calculus. The chief propositions are: The difference between a variable and its limit is a variable whose limit is zero. If two variables are continually equal and each approaches a limit, their limits are equal. If one of two continually equal variables approaches a limit, the other has the same limit. The limit of the variable sum of a finite number of variables is the sum of their limits. The limit of the variable product of two or more variables is the product of their limits. The limit of the variable quotient of two variables is the quotient of their limits, except when the limit of the divisor is zero. The limit of the product of a variable and a constant is the product of the constant by the limit of the variable. The product quotient or sum of two or more variables being equal to a constant, the product quotient or sum of their limits will equal the same constant.

**Limits of Elasticity.** See ELASTIC LIMIT.

**Limnæus.** Genus of basommatophorous Pulmonates, including the ordinary Pond-snails.

**Limoges.** Ancient city of w. central France, on the Vienne; taken by assault 1370 by the Black Prince, who gave it up to fire and sword. It suffered repeatedly from war from the



Limoges.

5th century, when it was laid waste by Vandals and Visigoths, and often captured by French and English during the Hundred Years' war. It has manufactures of porcelain and of woolen goods. Pop., 1891, 72,697.

**Limonite.** See BOG IRON ORE.

**Limousin,** LEONARD, b. ab.1505. One of the Limousin school of enamelers, France. Flourished from 1532–74.

**Limpet.** See CYCLOBRANCHIATA.

**Limpidity of a Liquid.** Determined by the readiness with which it responds to a force tending to produce relative motion of its parts. Limpidity is the opposite to viscosity. Thus alcohol is more limpid than water, and water more so than syrup.

**Limpopo.** Large river of S. Africa. It rises in the mountains of the Transvaal, and pursues a circuitous course to its mouth near Delagoa Bay.

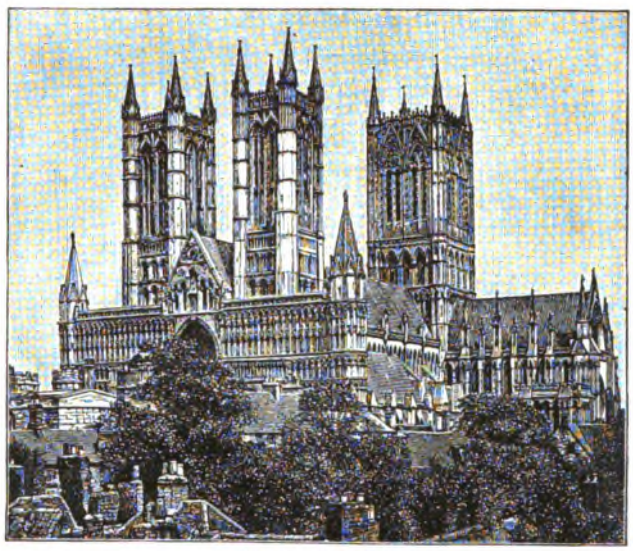
**Limulus.** See PŒCILOPODA.

**Linaceæ.** Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Dicotyledons*, comprising 15 genera and ab. 235 species, widely distributed throughout all parts of the earth; called the Flax family.

**Linacre,** or **Lynaker,** THOMAS, ab. 1460–1524. Physician to Henry VII. and VIII.; founder Coll. of Physicians, London; promoter of Greek studies. He tr. Galen into Latin, and wrote on Latin grammar.

**Linares,** JOSÉ MARIA, 1810–1861. Pres. of Bolivia 1857–61.

**Lincoln.** Capital of Lincolnshire; 42 m. s. of Hull; noted for its fine cathedral and annual horse-fair; besieged and



Lincoln Cathedral.

taken by Parliament's forces 1644. Here King Stephen was defeated and made prisoner 1141. Pop., 1891, 41,491.

**Lincoln.** Capital of Nebraska and of Lancaster co.; on Salt Creek, 66 m. s. w. of Omaha; founded 1867; seat of the State Univ. and of Wesleyan, Cotner, and Normal universities. It has considerable manufactures. Pop., 1890, 55,154.

**Lincoln,** ABRAHAM. 1809–1865. Sixteenth pres. U. S.; b. in Ky.; he grew up in pioneer life with few advantages. Obtaining a position in a country store in Ill. at ab. 21, he borrowed some books, and in leisure moments began to educate himself. When the Black Hawk war broke out, he volunteered and was elected captain. He was in the Ill. Legislature 1834–42; practiced law at Springfield from 1839, and was in Congress 1847–49. He was brought more prominently into public life by the agitation over the repeal of the Missouri Compromise act 1854, and entered upon public discussions with such earnestness, intelligence, and enthusiasm as to make him a leader of the anti-slavery element. In 1858 he challenged Stephen A. Douglas, who was seeking re-election as Senator and was author of the repeal, to a public debate of the leading issues. His speeches in this campaign won him a national reputation. In 1860 he was elected to the presidency. Between his election and his inauguration the secession movement was getting well on foot. In his inaugural address he denied the right of secession and announced the purpose of his administration to maintain the Union; this, rather than the mere extirpation of slavery, was the primary and ruling motive of his administration. He disclaimed any intention to invade or subjugate the seceding States, and not until Fort Sumter was reduced did he recognize civil war as a fact and call for troops. While the war was in progress it was a question of great difficulty and delicacy to know how to deal with the fact of slavery. He tried long and in vain to induce the States to surrender their slaves for a compensation. When all propositions of that nature failed, he issued, Sept. 22, 1862, the preliminary proclama-

tion of emancipation, which declared all slaves in regions then in rebellion free from Jan. 1, 1863. Under the extraordinary difficulties of his vast task he displayed phenomenal wisdom, tact, gentleness, patience and self-forgetfulness.

A strong effort was made to defeat his re-election by those in the North who were dissatisfied with his management of the war or out of sympathy with the principles underlying it. But he was re-elected by an overwhelming majority both on popular and electoral vote, Gen. McClellan, the opposing candidate, receiving only 21 electoral votes out of 233. Meantime the war was drawing to a close, and, shortly after Lincoln's second inaugural, was terminated by the surrender of

Abraham Lincoln.

Lee, April 9, 1865. On April 11 he made his last public address. On the evening of April 14, while at Ford's Theater, he was shot by John Wilkes Booth, and died the following morning, to the incalculable loss and sorrow of the nation.

Long underrated, owing to the humbleness of his origin, his unpretentiousness, and his frank Western humor, he came to be recognized as by far the greatest man of his time, ranking with Washington in loving and reverent memory. His abilities were equaled by the greatness of his heart and the beauty of his character. Some of his sayings are household words: his Gettysburg address, Nov. 1863, is among the noblest triumphs of patriotic eloquence.—His son, ROBERT TODD, b. 1843, was Sec. of War 1881–85, and Minister to England 1889–93.

**Lincoln,** BENJAMIN, 1733–1810. General in the Revolution; Sec. of War 1781–84. In 1786 he commanded the Mass. militia in repressing Shay's rebellion.—His relative, LEVI, 1749–1820, was U.S. Atty.-gen. 1801–5.—Of his sons LEVI, LL.D., 1782–1868, was Gov. of Mass. 1826–34; ENOCH, 1788–1829, was M.C. 1818–26, and Gov. of Me. from 1827.

**Lincoln,** MT. Highest summit of the Park range, Col. Altitude 14,297 ft.

**Lind,** JENNY, 1820–1887. "Swedish Nightingale." She sang in Stockholm 1838–41 before going to Paris to perfect her art under Garcia. She failed of an engagement at the Grand Opera 1842, and ever after declined all offers from that source. She sang in Berlin and other cities, and in 1847 went to London, where her triumphs were unparalleled; but she abandoned the operatic stage 1849. Her visit to America 1850–52, was under Barnum's management. In 1852 she married Otto Goldschmidt, a member of her concert company in Boston. England was her home from 1856; and she taught singing in the Royal Coll. of Music 1883–86. Her last public appearance as a singer was 1870 at Düsseldorf, when she sang in her husband's oratorio, *Ruth*.

**Lindau,** PAUL, b. 1839. German journalist, critic, dramatist and novelist.

**Lindegren,** AMALIA, b. 1814. Swedish portrait-painter.

**Linden.** Trees of the genus *Tilia*, natural family *Tiliaceæ*, natives of the n. hemisphere; known also as Basswood. The European Linden, *T. Europæa*, is known as Lime-tree. Its inner bark, called Bast, is extensively used for mats and ropes.

**Lindenthal,** GUSTAV, b. 1850. Austrian civil engineer, designer of the proposed suspension bridge of 3,300 feet span over the Hudson at New York.

**Linderman,** HENRY RICHARD, M.D., 1825–1879. Chief clerk of Phila. Mint 1855–64, and its director 1867–69; supt. U.S. mints from 1873. With J. J. Knox he framed the Coinage act of 1873. *Money and Legal Tender*, 1877.

**Lindley,** JOHN, F.R.S., 1799–1865. Prof. of Botany in Univ. Coll., London, 1829. *Rosarum Monographia*, 1820; *Synopsis of British Flora*, 1829; *Introduction to the Natural System of Botany*, 1830; *Fossil Flora of Great Britain*, with W. Hutton, 1831–37; *Flora Medica*, 1838; *Theory of Horticulture*, 1849; *Vegetable Kingdom*, 1846; *Treasury of Botany*, with T. Moore, 1866.

**Lindner,** ALBERT, 1831–1888. German dramatist.

**Lindo,** MARK PRAGER ("HEER SMITS"), 1819–1877. Anglo-Dutch author and translator. *Le Saltimbanque*, 1859.

**Lindsay,** SIR DAVID. See LYNDSAY.

**Lindsay,** WILLIAM L., b. 1835 in Va. Judge Ky. Supreme Court 1870, Chief-justice 1876–78; U.S. Senator 1893.

**Lindsey,** THEOPHILUS, 1723–1808. Pioneer of Unitarianism in London 1774, having left the Ch. of England.

**Lindsley,** PHILIP, D.D., 1786–1855. Prof. Princeton 1813, vice-pres. 1817; pres. Cumberland Coll., Tenn., 1824–50. *Works*, 3 vols., 1868.

**Line.** In elementary geometry, one dimension of space considered regardless of others, or length without breadth or thickness. In higher discussions, path of a point moving under any law. Lines are classified as straight or curved. The equator.

**Lineal Promotion.** That of an officer in his branch of the service according to seniority, as distinguished from regimental promotion. This is the rule in the U. S. Army, except as to line officers in service Oct. 1, 1890, above second lieutenant.

**Lineal Rank.** That of an officer of the line, relatively to others of the same branch. The army register contains tables of the lineal rank of officers of the cavalry, artillery, and infantry, and another of all officers.

**Linear.** In Botany, leaves or other organs which are narrow and several times longer than broad.

**Linear.** Belonging to lines, as linear projection, or that which is composed of lines, as linear figure.

**Linear Expression,** or EQUATION. One in which the terms are of the first degree: such an expression taken together becomes a linear factor.

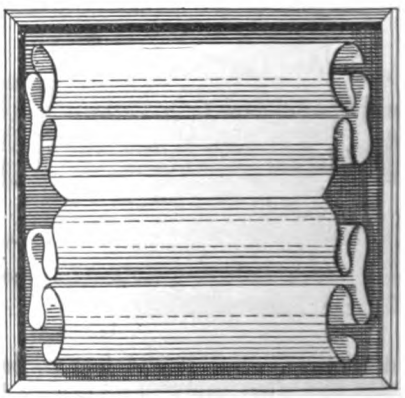
**Linear Transformation.** That of an equation of two or more variables by substituting for each variable a linear function of the variables; called also linear substitution.

**Lineate.** Leaves, petals, or other organs marked by short parallel lines.

**Line Breeding.** Breeding together of animals having the same characteristics and descended from common ancestors a few generations back. It requires less skill than successful inbreeding, and is less likely to be attended with bad results.

**Linen.** Cloth made of flax and having many grades of fineness, and several forms distinguished by their figures; as CAMBRIC and DAMASK (q.v.). It is either grass bleached or aided by bleaching powder. The former is more durable. It was known at an early day, pieces still being in existence which were woven 4,000 years ago. The ancient Egyptian linen is far superior to the finest modern in quality and evenness of the threads. One specimen has 540 threads in the warp and 110 in the woof to the inch. See FLAX.

**Linen Scroll.** Style of wood carving especially common among the Germans of the later 15th and the 16th centuries, used to fill panels. The name came from its resemblance to a napkin closely folded in convolutions. Sometimes called the napkin pattern.



Linen Scroll.

**Line of Buoyancy.** Vertical line through the center of buoyancy of a floating body.

**Line of Collimation.** See COLLIMATION, LINE OF.

**Line of Defense.** Range of fire-arms in use, which therefore governs the length of the curtain in bas-

tioned works; distance from the salient of the bastion to the opposite curtain angle.

**Line of Fire.** In gunnery, prolongation of the axis of the piece.

**Line of No Variation.** Line joining the places at which the magnetic needle does not vary from the true meridian. In the U. S. it passes through Mich., Ohio, Ky., N. C. and S. C. E. of this line the needle points to the w. of the true meridian, and vice versa. This line has a slow motion, westward.

**Line of Resistance.** One drawn within the cross-section of a wall or arch which joins the points where the resultant of the forces above certain joints cuts the plane of those joints. It should fall within the middle third of the wall or arch to insure stability.

**Line of Sight.** Straight line passing through the front and rear sights of a gun and the point aimed at.

**Line of the Bastion Capital.** In the bastion system of fortification, line bisecting the interior angle of the polygon, upon whose sides the bastion fronts are constructed. It is the line of symmetry for the interior faces and flanks.

**Lines of Operation,** STRATEGICAL. That portion of a country, between the base of an army and its front of operations, which contains the railroads, wagon roads, and water routes by which the army advances and receives its supplies. When the various routes are within easy supporting distance of each other, they constitute a single line; when separated by a day's march or more, they become double or multiple lines.

**Line Squalls.** Long narrow band of rain and violent wind accompanying a barometric depression, mostly on the s.e. side, in the n. hemisphere. The wind within this band blows diagonally across it as if rotating spirally about a long horizontal axis. When these occur in warm weather, the long band constitutes a series of thunder storms; when symmetrically developed, the approaching band of clouds, accompanied by wind, constitutes the arched squall of the tropics. When the local air is rather dry and the advancing air still drier, the clouds give but little rain; dust is the conspicuous feature, and the phenomena are as seen in the Pampero, the Simoom, the Norther and the Bora.

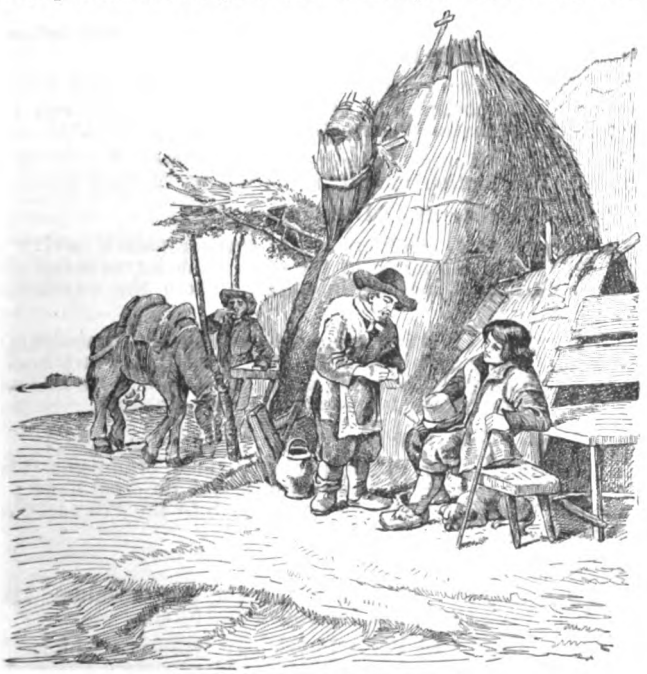
**Line Storm.** That which occurs nearest to the time when the sun crosses the line, namely the equinoctial.

**Ling.** See BILSTED.

**Ling,** PEHR HENRIK, 1776–1839. Swedish poet and dramatist, prof. Stockholm 1825; apostle of gymnastics, like the German Jahn.

**Lingard,** JOHN, D.D., LL.D., 1771–1851. English R. C. historian. *Anglo-Saxon Ch.*, 1806–45; *Hist. England to 1688*, 8 vols., 1819–30.

**Lingelbach,** 1622–1674. German artist of the Dutch school who painted Italian ports and landscapes. Not an artist of the first order he gained much by his travels and careful study of masterpieces. His works are found in all of the large galleries of Europe.



The Rural Cottage, by Lingelbach.

**Lingg,** HERMANN, b. 1820. German poet, dramatist and novelist.

**Lingua.** Central part of the ligula in insects; tongue.

**Lingua Franca.** Mongrel language used in the Mediterranean; chiefly based on Italian.

**Lingual Ribbon.** See RADULA.

**Linguatulida** (PENTASTOMIDA). Parasitic Arachnids, with vermiform body, with two pairs of hooks near the jawless mouth. *Pentastomum* is an example. As a larva it encysts itself in the liver of a host (a herbivore), and later becomes sexually mature in the nasal passages of another host (a carnivore which has eaten the raw flesh of the first host).

**Linguistics.** See LANGUAGES.

**Lingula.** See ECARDINES.

**Lingulate.** In Botany and Zoölogy, tongue-shaped organs.

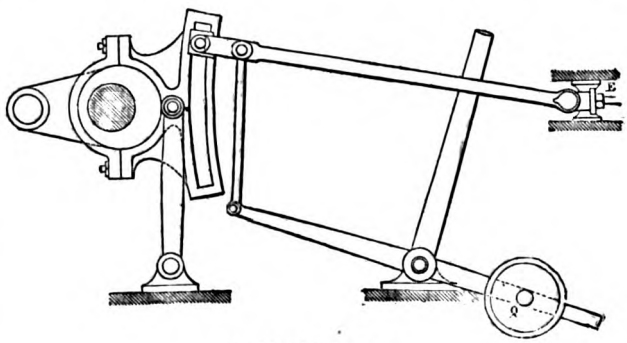
**Ling-Wang.** Chinese emperor of the Chow dynasty, during whose reign (571–544 B.C.) Confucius was born.

**Liniers y Bremont,** ANTOINE MARIE DE, 1756–1810. French officer in the Spanish navy; viceroy of La Plata 1808–9, whence he drove the British forces.

**Linine.** In Cytology, certain threads in the nucleus of plant cells.

**Link,** HEINRICH FRIEDRICH, 1767–1851. Prof. Rostock 1792, Breslau 1811, and Berlin 1815. *Philosophiæ botanicæ novæ*, 1798; *Enumeratio plantarum horti regii botanici Berolinensis*, 1821–22; *Elementa philosophiæ botanicæ*, 1824; *Handbuch zur Erkennung*, 1829–33.

**Link Motions.** Combinations of rods and levers by which the rotary motion of cranks and eccentrics, or the reciprocating motion of the piston, is transmitted to the steam valves of an engine. The design of these mechanisms is to enable the engine to be easily and rapidly reversed, and to admit of adjustable cut-off of steam admission on either forward or backward gear. The most usual of these is the STEPHENSON LINK MOTION (q.v.), used on locomotives; the Gooch, which reverses the curvature of the Stephenson link, and raises and lowers the valve stem; the Allan, which shifts the link and the valve stem equally in opposite directions and uses a straight link; the Fink, which uses one eccentric only, with which the link is solid; and the Walschaert gear. See JOY VALVE GEAR.



Fink's Link Motion.

**Linley,** THOMAS, ab. 1725–1795. English composer of songs and operas; musical director at Drury Lane 1776–91.—His sons, THOMAS, 1756–1778, and WILLIAM, 1767–1835, were also musicians.

**Linn,** JOHN BLAIR, D.D., 1777–1804. Presb. pastor in Phila. 1799; poet. *Power of Genius*, 1801; *Valerian*, 1805.

**Linn,** LEWIS FIELDS, 1795–1843. U. S. Senator from Ky. 1833–43.

**Linnæite.** $Co_3S_4$. Cobalt sulphide, with sometimes nickel and iron in place of part of the cobalt; valuable, when found in sufficient quantity, for the cobalt it contains.

**Linnæus,** or **Linné,** CARL VON, 1707–1778. Swedish botanist, famous for his classification of plants; prof. Upsala from 1740; ennobled 1757. *Systema Naturæ*, 1740; *Fundamenta*

*Botanica*, 1736; *Flora Lapponica*, 1737; *Genera Plantarum*, 1737; *Classes Plantarum*, 1738; *Flora Suecica*, 1745; *Amœnitates Academicæ*, 1749; *Philosophia Botanica*, 1751; *Species Plantarum*, 1753; *Systema Vegetabilium*, 1774; *Termini Botanici*, 1781.

**Linné.** Small lunar crater which gives some evidence of having undergone a recent change.

**Linné,** CARL VON, 1741–1783. Son of Linnæus; prof. at Upsala 1763. *Dissertatio botanica*, 1779; *Methodus muscorum illustrata*, 1781.

**Linnean Society.** Founded 1788 in London; chartered 1802; owner, since 1828, of Linnæus' collections and books, purchased 1783 by its first pres., Sir James E. Smith.

**Linnell,** JOHN, 1792–1882. English painter, engraver and sculptor.

**Linnet** (FRINGILLA CANNABINA). Migratory song bird of Europe, spending its winters in n. Africa and s. Europe, length 6 in. Its color is red in summer and brown in winter. In n. N. America the allied Redpolls (*Acanthis*) are also called linnets.

**Linoleic Acid.** $C_{16}H_{28}O_2$. Combined with glycerin in linseed oil and other drying oils; yellow oil, obtained by the decomposition of linseed oil. It takes up oxygen with great ease, and thus imparts the peculiar characteristics to several drying oils.

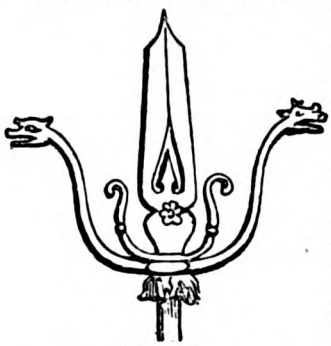
**Linoleum.** Floor oilcloth made by pressing on coarse burlap a mixture of boiled linseed oil and finely ground cork. Invented by William Walton 1860.

**Linseed.** Seed of FLAX (q.v.).

**Linseed Meal.** Ground cake of flaxseed after the oil has been expressed. Two kinds are known. The one (old process) is made from seed from which the fat has been extracted by pressure, the other (new process) from seed from which the fat has been extracted by treatment with gasoline or some other solvent. The former is much richer in fat than the latter. Both make a palatable fodder, rich in protein matter.

**Linseed Oil.** Oil expressed from flaxseed, 18–27 per cent by weight. It dries rapidly when applied to any body exposed to the air. It dissolves oxide of lead when heated, and is thereby decolorized and rendered more drying; called boiled oil. It is used in the arts, especially in the manufacture of paints.

**Linstock.** Short staff, shod with iron to plant it in the ground, having a two-forked iron socket to contain the ignited slow match, by which guns were formerly fired.



Linstock.

**Lint.** Linen cloth when shredded down so as to form a soft material. Used for dressing wounds.

**Linton,** JAMES DRUMGOLE, b. 1840. English historical and genre painter.

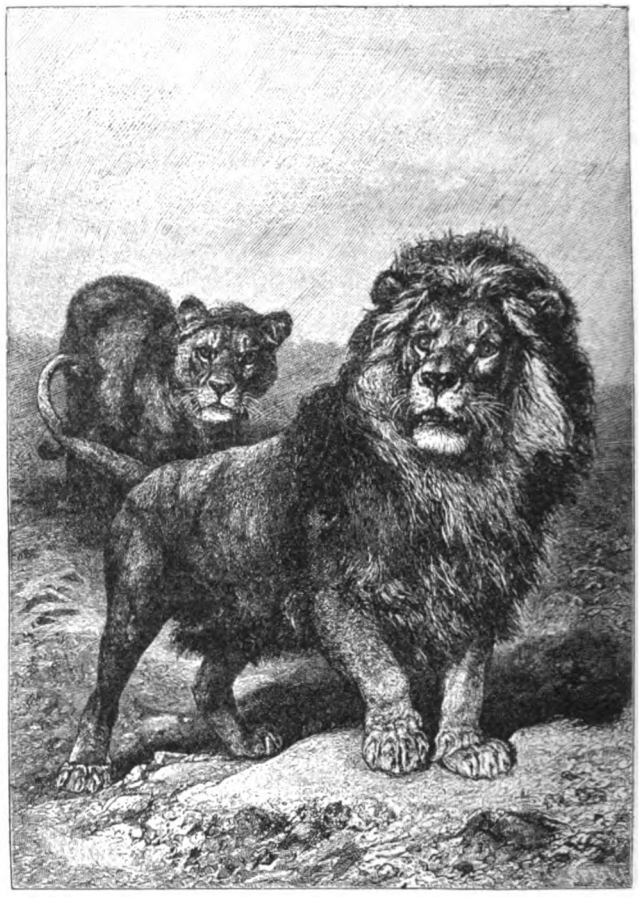
**Linton,** WILLIAM JAMES, b. 1812. N.A. 1882. Anglo-American engraver and author, illustrator of many books; poet, Chartist, and friend of Mazzini. *Wood Engraving*, 1879–87; *Three-score Years and Ten*, 1894.—His wife, ELIZA LYNN, b. 1822, is an English novelist and journalist. *Lizzie Lorton*, 1866; *Joshua Davidson*, 1872; *Girl of the Period*, 1883; *Christopher Kirkland*, 1885.

**Linus.** Son of Apollo and a Muse; instructor of Orpheus and Hercules; personification of a dirge or lamentation.

**Linus.** Traditional successor of St. Peter at Rome, by some accounted its first or second bishop.

**Linz.** Capital of Upper Austria; on the Danube, 117 m. w. of Vienna; besieged 1626 and 1741. Peace was made here with Hungary 1645; near it Bernadotte won a victory 1809. It has a large trade. Pop., 1891, 47,560.

**Lion.** The geographical range of lions was greater in the past; it is now restricted to Africa and central s. Asia. They live in rocky, sandy plains, or lie in wait among the bushes of river courses; they prey at night, and only the adult elephant and rhinoceros escape attack. Lions are not so large or so strong as tigers. A full-grown male attains a length of 9 ft., weight of 600 lbs., and an age of 30 to 40 years. The color is mainly yellowish brown. The mane of the male begins to grow the third year, and is complete in 3 years. The pupil of the eye, as in Leopards and Tigers, is round when contracted.



Lion

Lions are monogamous and the cubs, 2 to 4 in number, remain with the parents nearly 3 years. See FELIDÆ.

**Lion's-Foot.** *Prenanthes serpentaria.* Coarse herb of the Composite family, native of e. N. America, known as Gall-of-the-Earth.

**Liotard,** JEAN ETIENNE, 1702–1789. Swiss painter, who worked much in pastels. His *Chocolate Girl*, in the Dresden Gallery, has world-wide reputation.

**Lip.** In Botany, lower division, or both, of the labiate corolla or calyx; also libellum in orchids.

**Lip Cells.** Two cells of the elastic ring or annulus which embraces the sporanges of certain ferns, between which the ring breaks at maturity, expelling the spores. See ANNULUS.

**Lip Fern.** Ferns of the genus *Cheilanthes*, of wide geographical distribution, mainly inhabiting dry clefts of rocks.

**Lipocephala.** See LAMELLIBRANCHIATA.

**Lipogastrosis.** Obliteration of the paragastric cavity of a sponge, due to infoldings of the wall. This leaves indefinite canals and spaces, not distinguishable from the excurrent canals.

**Lipogram.** Writing characterized by the omission of words containing certain letters. Lasus, 538 B.C., practiced it first. Tryphiodorus, about the same time, wrote 24 books each one omitting one of the letters of the Greek alphabet.

**Lipoma.** Fatty tumor.

**Lipostaura.** In Promorphology, those organisms that have an axis or several axes (axonia) but no cross axes; so named by Hæckel. They are separated into the POLYAXONIA and the MONAXONIA (q.v.).

**Lipostoma.** See SPOROZA.

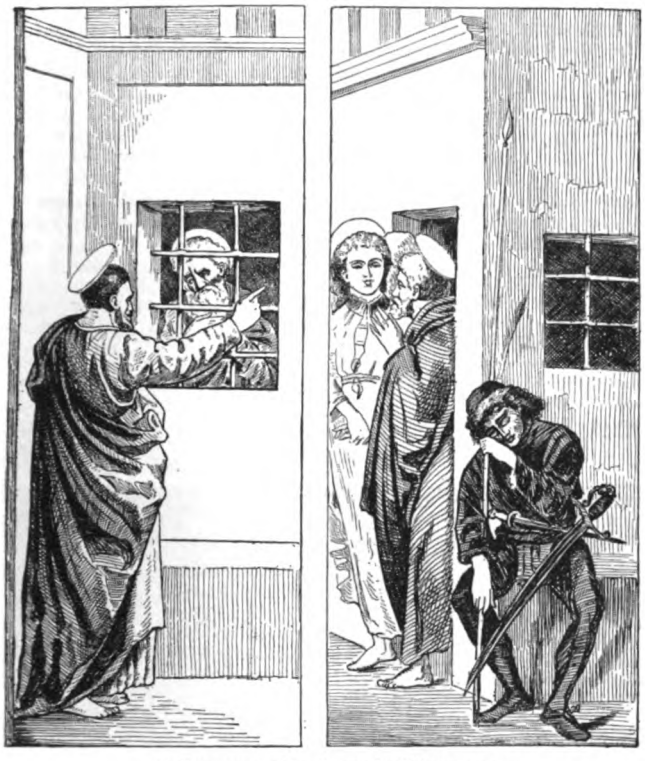
**Lipostomosis.** Obliteration of the true osculum in a sponge, and substitution of PSEUDOPROCTS (q.v.).

**Lipoxenous.** In Plant Physiology, parasites which become detached from the host-plant and complete their life history as independent organisms.

**Lippard,** GEORGE, 1822–1854. American novelist.

**Lippe.** Principality of n. w. Germany. Area 469 sq. m. Pop., 1890, 128,495.

**Lippi,** FILIPPO, 1412–1469. Florentine monk and painter. Important frescoes of his are at Prato, and many fine easel



Deliverance of St. Peter, by Filippo Lippi.

pictures are extant.—His reputed son, FILIPPINO, ab. 1457–1504, has important frescoes in Maria Novella and in Brancacci Chapel, at Florence. Next to Massaccio, and with Signorelli, he was the most powerful fresco painter of his time. He left also many fine easel pictures.

**Lippincott,** JOSHUA BALLINGER, 1813–1886. Founder of a publishing house in Phila. 1836, and of Lippincott's *Magazine*, 1886.

**Lippincott,** SARA JANE (CLARKE) ("GRACE GREENWOOD"), b. 1823, m. 1853. American author.

**Lip Reading.** Acquiring the power of speech by deaf-mutes by imitating the movements of the tongue and mouth of one speaking, holding the hand upon the larynx of the teacher, thus learning to control as much as possible harshness of sound, which is always present to a greater or less degree.

**Lips.** Two fleshy folds which surround the orifice of the mouth, of a more or less livid red, composed of different muscular fasciculi, nerves, and vessels, covered by the skin and mucous membrane of the mouth. They owe their sensitiveness to an abundant supply of nerve fibers. They form part of the organs of speech and are necessary to the pronunciation of certain letters called labials.

**Lipsius,** JUSTUS, 1547–1606. Prof. at Jena 1572, Leyden 1579, Louvain 1576 and 1592; ed. Tacitus 1574, and other Latin classics.

**Lipsius,** RICHARD ADELBERT, D.D., 1830–1892. Prof. at Leipzig 1859, Vienna 1861, Kiel 1865, and Jena 1871. *Dogmatics*, 1876.—His brother, JUSTUS HERMANN, b. 1834, prof. at Leipzig 1877, is a noted philologist.—His sister, MARIE ("LA MARA"), b. 1837, is a writer on music.

**Liquefaction.** Process of making liquid; conversion of a gas or vapor into a liquid, or melting of a solid. Liquefaction of gases is accomplished by the aid of cold and pressure, that of solids usually by heat.

**Liquid.** That state of matter in which the cohesion is so far reduced that the molecules may move freely about throughout the mass and are capable of being displaced by application of the slightest force. Thus, if a body of liquid be subjected to a shearing stress, the ratio of this stress to the strain produced is not constant, as in the case of a perfect solid, but decreases with the time. This ratio is the viscosity of the liquid.

**Liquidambar.** Resin of the Sweet Gum Tree, *Liquidambar styraciflua*, a large forest tree of s.e. N. America; used in chewing gum.

**Liquidated Damages.** Those in their nature uncertain and difficult of ascertainment, but which have been legally fixed at a certain sum by agreement.

**Liquids.** In Phonetics, the various sounds expressed by the letters *r* and *l*. See FLUIDS.

**Liquor Ferri Chlorati.** Solution of ferrous chloride, containing 10 per cent iron, used in medicine.

**Liquor Ferri Sesquichlorati.** Solution of ferric chloride, used in medicine.

**Liquorice.** *Glycyrrhiza glabra*. Sweet-rooted perennial plant of the natural family *Leguminosæ*, native of s. Europe; extensively cultivated. The N. American wild Liquorice, *G. lepidota*, is native of the northwest.

**Liquorice,** WILD. Species of the genus *Galium*, low herbs of the natural family *Rubiaceæ*, natives of N. America.

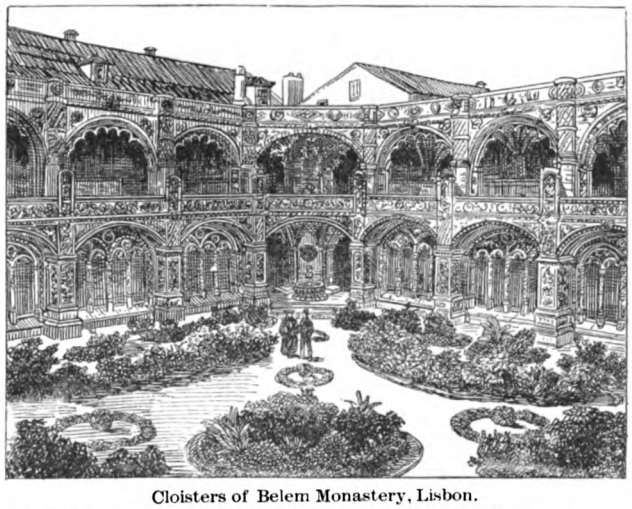
**Liquor Stibii Muriatici.** Solution of antimony trichloride, used in medicine.

**Lira.** Italian silver coin, equal to a franc, or 19.3 cents.

**Lisboa,** JOAO FRANCISCO, 1812–1863. Brazilian historical writer.

Liquorice (*Glycyrrhiza glabra*): *a*, root.

**Lisbon.** Capital of Portugal, since 1422; on the Tagus, near its mouth; founded by Romans; captured by Moors 716 and retained till 1147; mostly burned by Castilian army 1373; held by Spain from 1580 till taken by Duke of Braganza 1640;



Cloisters of Belem Monastery, Lisbon.

visited Nov. 1, 1755, by an earthquake which destroyed over 30,000 inhabitants; stricken by yellow fever 1859. It has some fine buildings, academies of sciences and arts, a public library of 200,000 vols., and a large commerce, but little manufactures. Pop. with suburbs, taken in 1885, 307,700.

**Lis Pendens.** Such pendency of a suit as brings the subject-matter within the court's custody and prevents a purchaser from getting title unaffected by the judgment.

**Lissa.** Island in the Adriatic, belonging to Austria, off which the Italian fleet was defeated by the Austrian, July 20, 1866. Area 35 sq. m.; pop. ab. 8,000.

**Lissajou's Curves.** See KALEIDOPHONE.

**Lissencephala.** Group of Mammals, including the Bats, *Insectivora*, Rodents, and *Edentata*. They have smooth or nearly smooth cerebral hemispheres that do not cover the cerebellum. A corpus callosum is present.

**List,** FRIEDRICH, 1789–1846. German economist, in Pa.

1825–30; founder of Tamaqua, Pa. *New System of Political Economy*, 1827; *Nationale System*, 1841.

**Lista y Aragon,** ALBERTO, 1775–1848. Spanish poet.

**Lister,** SIR JOSEPH, M.D., LL.D., D.C.L., F.R.S., b. 1827. Prof. of Surgery at Glasgow, Edinburgh, and in London 1877; Baronet 1883. *Antiseptic System*, 1870; *Germ Theory of Putrefaction*, 1875.

**Listerism.** Antiseptic surgery. See LISTER, JOSEPH.

**Listing.** Process of raising corn, much in vogue in the drier and warmer regions of the corn-growing belt. It is generally used where corn follows corn without an intervening crop, and consists in simply throwing out a deep furrow with a double moldboard plow and planting the seed in drills in the bottom of the furrow. After cultivation, it gradually works the ridges down about the young plants in the end, leaving the ground nearly level and the roots of the corn much deeper in the ground than in the ordinary method. The advantages claimed for listing are less labor in preparation and cultivation of the soil, and greater drought-resisting power in the plant.

**Listing,** JOHANN BENEDICT, 1808–1882. Prof. of Physics at Göttingen from 1839; specialist in optics. *Der Census raümlicker Complexe*, 1861.

**Liston,** JOHN, 1776–1846. English comic actor, noted as "Paul Pry"; retired 1837.

**Liston,** ROBERT, F.R.S., 1794–1847. Scottish surgeon, eminent as operator and teacher; prof. Univ. Coll., London, 1835. *Surgery*, 1831–37.

**Liszt,** FRANZ, 1811–1886. Hungarian musician, most brilliant pianoforte virtuoso of his time; also composer conductor, teacher and essayist. He was Czerny's pupil at Vienna, and in 1823 was signally honored by Beethoven. In 1825 his operetta *Don Sancho* was produced in Paris. He became, through the influence of Berlioz, a champion of Programme Music. His career as pianist was peerlessly brilliant, but he abandoned it 1847, and was Court Chapelmaster at Weimar 1847–61; doing herculean service for Wagner and modern tendencies, educating many pianists, and composing. While in Paris he had by the Countess d'Agoult three children, one of whom became the

Franz Liszt.

wife of Von Bülow and afterward of Wagner, and another of Ollivier. He took minor orders 1865, and was thereafter known as Abbé Liszt. As a musical essayist he labored for Wagner and Franz polemically, wrote a book on Chopin, 1852, and one on the music of the Gypsies, 1861. Principal compositions. Symphonies: *Dante; Eine Faust Symphonie*. Symphonic poems: *Ce qu'on entend sur la Montagne; Tasso; Les Préludes; Orpheus; Prometheus; Mazeppa; Fest Klänge; Héroïde funèbre; Hungaria; Hamlet; Hunnenschlacht; Du Ideale; Von der Wiege bis zum Grabe*. Oratorios: *Christus; Stanislaus; Die Legende von der Neiligen Elizabeth*. Masses, motets, pianoforte concertos, smaller pieces and transcriptions.

**Litany.** Responsive supplication, developed from Kyrie eleison; used in Gaul ab. 400 in processions at times of public calamity, and soon general in the west. The English litany was compiled by Cranmer 1544, and appended to Morning Prayer 1552.

**Litchi.** *Nephelium litchi*. Small tree of the natural family *Sapindaceæ*, native of China, bearing globular, rough-shelled fruits an inch or more in diameter, inclosing a sub-acid jelly-like pulp, highly esteemed by the Chinese, and exported in quantities to Europe and America.

**Literal.** In Mathematics, expressed in letters; opposed to numerical.

**Literary Fund,** ROYAL. Founded in Eng. to relieve literary men of all nations by David Williams, 1790; incorporated 1818.

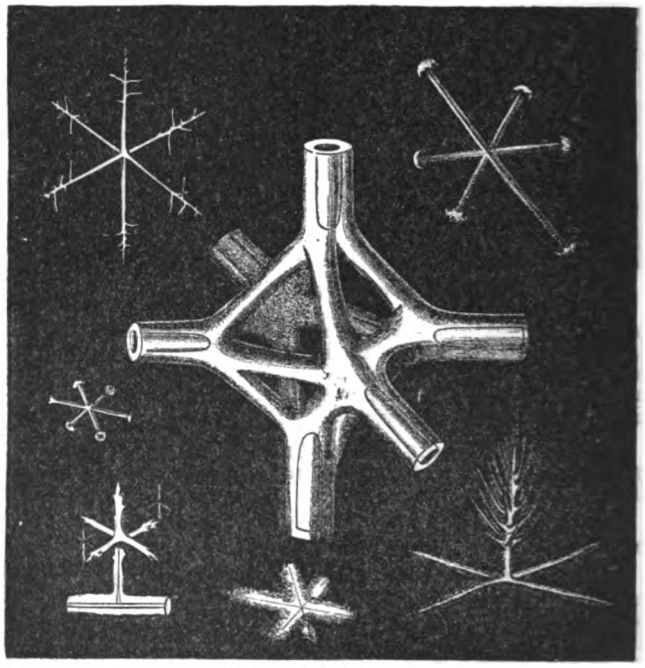
**Lithæmia.** Condition in which the presence of undue amounts of uric acid and urates, or derivatives of the first, as xanthin or hypoxanthin, in the system gives rise to headache, pains in the joints and muscles, secretion of highly irritating urine, indigestion and troublesome eruptions. The tendency is inherited and the condition itself may be followed by gout, of which it is in reality a mild form. The diet should contain little starchy food and the elimination of the uric acid, etc., should be promoted by free drinking of water and the use of alkalies, especially the lithium salts· all forms of alcohol are usually harmful.

**Litharge.** See LEAD OXIDE.

**Lithgow,** WILLIAM, 1583–1645. Scottish traveler who walked over 36,000 miles through Europe, Asia and Africa. *Adventures and Peregrinations*, 1614.

**Lithic Acid Diathesis.** Constitution favorable to the production of lithæmia.

**Lithistidæ** (VITREOUS SPONGES). Order of *Plethospongiæ*, in which the skeleton is entirely siliceous, firm, and incrusting,



Species of Lithistidæ.

or coral-like. The spicules are quadri-radiate, with irregular branches that interlock with neighboring spicules. They live in the deeper ocean.

**Lithium.** Li. At.wt. 7.02, sp.gr. .594, sp.ht. .94, valence I. Discovered by Arfvedson 1817. It occurs in petalite, lepidolite, in some mineral springs, in the ash of many plants, especially in those of tobacco and the beet. It is the lightest metal known, of a silvery white color, decomposes water at ordinary temperatures, and burns with an intense white light. It is one of the alkali metals.

**Lithium Bromide.** LiBr. Hygroscopic crystalline crusts; made by neutralizing the carbonate with hydrobromic acid.

**Lithium Carbonate.** $Li_2CO_3$. Resembling the other alkali carbonates; made by adding sodium carbonate to a concentrated solution of lithium chloride; used in medicine as a solvent for uric acid; soluble in an aqueous solution of carbon dioxide.

**Lithium Chloride.** LiCl. Made by treating the metal with hydrochloric acid. It differs from the alkaline chlorides in that it is soluble in alcohol.

**Lithium Hydroxide.** LiOH. White, transparent substance, dissolving readily in water to form a strongly alkaline solution similar in its properties to caustic soda; made from lithium carbonate by treating it with calcium hydroxide in solution.

**Lithium Nitrate.** $LiNO_3$. Crystals, isomorphous with sodium nitrate; made by dissolving the carbonate in nitric acid.

**Lithium Oxide.** $Li_2O$. White crystalline mass, made by heating small quantities of lithium in a stream of oxygen.

**Lithium Phosphate.** $Li_3PO_4+\frac{1}{2}H_2O$. Heavy white precipitate, obtained on adding a solution of sodium hydrogen phosphate to lithium sulphate.

**Lithium Sulphate.** $Li_2SO_4$. White substance, made by treating the chloride or carbonate with sulphuric acid.

**Lithocysts.** See CRYSTAL CELLS.

**Lithofracteur.** Explosive compound, made by mixing 52 parts nitroglycerin, infusorial silica 30, carbon 12, sodium nitrate 4, sulphur 2.

**Lithographic Stone.** Yellowish-gray, fine-grained, slightly siliceous limestone, whose physical properties adapt it for use in lithographic printing. The quarries of Solenhofen, in Bavaria, are the best known, though stone possessing the desired qualities to a greater or less degree have been found in the U. S. and Canada.

**Lithography.** Printing from stone; invented in 1796 by a Bavarian, Aloys Senefelder (1771–1834). The design is drawn upon the polished stone with greasy crayons and inks, made of mixtures of lard, soap, wax, shellac, turpentine, sodium carbonate, and lampblack. It is then washed with a weak solution of nitric acid in gum arabic water to open the pores of the bare stone, so it will absorb water. A solution of gum arabic in water is then applied and the drawing ink removed by turpentine. The stone is now damped with a sponge, the water not adhering to the greasy drawing, and the stone inked with a greasy ink which adheres only to the greasy drawing; a piece of damp paper is laid upon the stone and subjected to the press, which transfers the impression to the paper. Drawings may also be made on prepared paper and transferred to the stone. The design may be etched upon stone, coated with gum arabic, and greasy matter rubbed into the lines, when it is absorbed by the exposed stone. See LITHOGRAPHIC STONE.

**Lithology.** Science that treats of rocks, with respect particularly to origin, mineral and chemical composition, texture, structure, and classification. In modern lithology, much use is made of the microscope. In French and in German the literature of the subject is extensive; in English the number of independent works has been relatively small, though the subject has been widely treated in works on general geology and in the reports of State or national geological surveys.

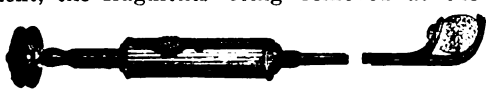
**Lithomarge.** Firm, hard and compact varieties of kaolinite and halloysite.

**Lithophilous.** Plants growing naturally in rocky situations.

**Lithospermous.** Plants bearing hard, stony seeds.

**Lithosphere.** The solid globe, irrespective of its aqueous and aerial envelopes.

**Lithotrity.** Crushing a stone in the bladder with an instrument, the fragments being removed at the time or



Instrument for Lithotrity.

allowed to escape with the urine; first performed by the French surgeon, Civiale, 1824.

**Lithotomy.** Cutting into the bladder for the removal of CALCULI (q.v.). Mentioned by Celsus 50.

**Lithuania.** Region of central Europe, early settled by Slavs; long an independent grandduchy; united with Poland 1386; now held mostly by Russia.

**Lithuanian Language.** See LETTISH.

**Litmus.** Blue dye-stuff obtained from *Roccella* and other lichens; soluble in water. It is turned red by acids and its natural blue is restored by alkalies. It is used as an indicator for acids and alkalies. Commercial litmus is the potassium salt, containing chalk or gypsum.

**Litolff,** HENRY CHARLES, 1818–1891. Alsatian pianist and composer, b. in London; pupil of Moscheles, admired virtuoso throughout Europe 1840–50. Of his ten operas only one, *Héloïse et Abelard*, had fair success.

**Litre.** Unit of the French or decimal measure of capacity, holding 1 kg. of water at 4° C. Volume of 61.027 cu. in., 0.264 U. S. gal., and 0.22 Imp. gal.

**Little,** THOMAS. See MOORE, THOMAS.

**Littledale,** RICHARD FREDERICK, LL.D., D.C.L., 1833–1890. Irish Anglican of extreme views, wide learning, and great literary activity, especially in matters liturgical, hymnic, and controversial.

**Little Rock.** Capital of Arkansas, and of Pulaski co., on the s. bank of the Arkansas River, here navigable. It has several colleges, and considerable trade and manufactures. Pop., 1890, 25,874.

**Littleton,** SIR THOMAS, ab.1402–1481. Justice of Common Pleas 1466; knighted 1475. His book on *Tenures*, written in law-French and tr. 1538 or earlier, was commented on by Coke 1628.—His descendant, ADAM, 1627–1694, became Prebendary of Westminster 1674, and pub. a Dict. of Latin, Greek, Hebrew, and English, 1678.

**Little Turtle,** d. 1812. Miami chief, who defeated Harmar 1790 and St. Clair 1791.

**Littoral.** Plants or animals occurring naturally along shores.

**Littoral Zone.** See BATHYMETRIC DISTRIBUTION.

**Littré,** MAXIMILIAN PAUL ÉMILE, 1801–1881. French philologist and writer on Comte and the positive philosophy; Academician 1871; life Senator 1875. *Hist. de la langue Française*, 1862. His great Dictionary appeared in 5 vols. 1863–72.

**Littrow,** JOSEPH JOHANN, 1781–1840. Bohemian astronomer, director from 1819 of the Vienna observatory, as was his son, KARL LUDWIG, 1811–1877, from 1842.

**Lituolidea.** Order of imperforate *Foraminifera*, with arenaceous shells, that are more or less polythalamous and labyrinthine in the connection of the chambers.

**Liturgy.** Properly, the Eucharistic prayers and rubrics. More widely, all written forms of Divine service. They existed from early periods in Syria, Egypt, Rome, and elsewhere: their study is called liturgics. The first prayer-books in English, those of Edward VI., 1549–52, were revised 1559, 1604 and 1662.

**Lituus.** Spiral defined by the equation $\rho=\frac{a}{\theta+b}$; where a and b are arbitrary constants.—Also a crooked staff or wand used by the augurs in their divinations.

Lituus.

**Liutprand,** ab. 922–ab. 972. Bp. of Cremona, Italy, 961; Envoy to Constantinople; Latin chronicler. His *Antapodosis* extends 886–950; his *De Gestis Ottonis* 960–964.

**Live-for-ever.** *Sedum telephium*. Fleshy, perennial herb of the Stonecrop family, native of Europe, introduced into N. America; also called Orpine. It is a weed troublesome to farmers because of the difficulty of eradication and the ease with which it propagates itself by detached portions of the stem. No method of fighting it is entirely successful, though recently efforts have been made to weaken it by cultivating on it a parasitic fungus.

**Livella.** In Lichenology, narrow, sessile apothecium.

**Live Load.** Weight of wagons and people on a highway bridge, or weight of locomotives and cars on a railroad bridge.

**Liver.** Largest gland of the body, weighing 3 to 5 lbs., measuring in man 10–12 in. transversely, 6–7 in. from before backward and about 3½ in. in its thickest part. It is situated in the abdomen, on the right side of the body beneath the diaphragm, and is held in position by folds of the peritonæum. It consists of a large number of lobules about $\frac{1}{50}$ in. in diameter, each of which contains or is surrounded by minute blood vessels and fine canals which unite to form the ducts, conveying the bile to the gall bladder, underneath organ, a portion however entering the duodenum directly. By the portal vein and its branches the blood from the stomach, intestines and spleen passes through and around the lobules, and after having been modified by the hepatic cells returns into the general circulation through the hepatic vein. The functions of the liver are the formation of bile, the conversion of the sugar and starchy bodies derived from the food into glucose and certain nitrogenous substances into urea. Congestion, cirrhosis and hepatitis are the chief diseases.

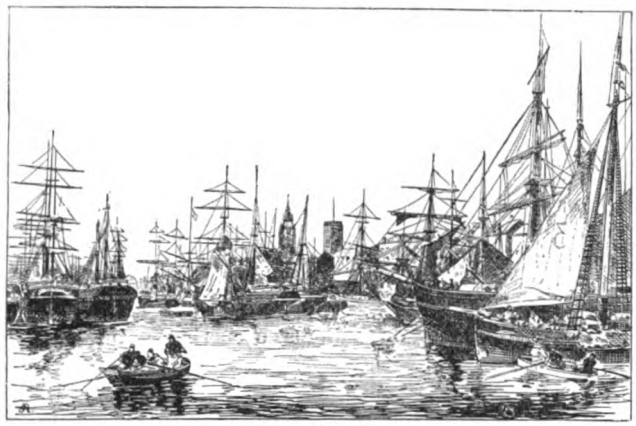
**Liver Leaf.** See HEPATICA.

**Livermore,** ABIEL ABBOT, D.D., 1811–1892. Ed. N. Y. *Christian Inquirer*, 1857; pres. theol. sem. at Meadville, Pa., 1863–89. Commentary on N. T., 6 vols., 1842–81.

**Livermore,** MARY ASHTON, b. 1821. American journalist, lecturer and reformer. *My Story of the War*, 1888.

**Liver of Sulphur.** See HEPAR SULPHURIS.

**Liverpool.** City of Lancashire, next to London the most important commercial seaport of England. Situated near the



Liverpool Docks.

mouth of the river Mersey, it has six miles of docks along its river front. Pop., 1891, 517,951.

**Liverpool,** CHARLES JENKINSON, EARL OF, 1727–1808. Sec. for War 1778–82; Pres. Board of Trade 1784–1801; Baron Hawkesbury 1786, Earl 1796.—His son and successor, ROBERT BANKS, 2d earl, 1770–1828, was Foreign Sec. 1801 and 1809, Home Sec. 1804 and 1807, and Prime Minister 1812–27.

**Liver Rot.** See TREMATODA.

**Liverworts.** HEPATICÆ (q.v.); also common spring flowering plant, *Hepatica hepatica*, properly known as Liver Leaf.

**Livery.** Distinctive dress given by masters to their male servants. It is derived from the custom of early French kings of giving clothes to servants at the royal expense. Members of the London city guilds are called Liverymen, as they wear the livery of their guilds.

**Livia,** d. 29. Wife of Augustus and mother of Tiberius.

**Living Force,** or ENERGY. Work which a moving body is capable of performing against a retarding or arresting resistance before being brought to rest. It is equal to the work which had to be done to bring the body to the velocity which it had before retardation began. A weight W falling through a height h represents a certain amount of work stored up. When that weight is arrested and its velocity reduced to zero, the arresting body must perform a work equal to $Wh = W\frac{v^2}{2g}$ (see FALLING BODIES): this is the general formula for living force. Since $\frac{W}{g} = M$ (see MASS), the more usual expression is $\frac{Mv^2}{2}$, which applies to arrested motion in all directions, and is general. Where velocity is merely changed and not arrested, the form is $\frac{M}{2}\left(v_0^2 - v_1^2\right)$. The living force will be greater or less at the end of the interval, according as the final velocity was greater or less than the initial. When the final velocity is zero, the equation returns to its first form.

**Livingston,** EDWARD, 1764–1836. M. C. from N. Y. 1795–1801; Mayor of New York 1801–3; in New Orleans 1804–31, where he drew up a famous code of civil and criminal law 1822–25; M. C. from La. 1824–29, U. S. Senator 1829–31; Sec. of State 1831–33; Minister to France 1833–35. Works on Jurisprudence, 1873.—His brother, ROBERT, LL.D., 1746–1813, was in Congress 1775–77 and 1779–81. Chancellor of N. Y. 1777–1801, and U. S. Minister to France 1801–4, and negotiator of the cession of La. 1803.—Their cousin, PHILIP, 1716–1778, was in Congress from 1774, and signed the Declaration of Independence.—His brother, WILLIAM, LL.D., 1723–1790, was in Congress 1774–75, and Gov. of N. J. from 1775.

**Livingstone,** DAVID, 1813–1873. Scottish missionary and explorer. He labored in S. Africa for 9 years from 1840, and discovered Lake Ngami Aug. 1, 1849. In 1853–55 he crossed Africa from the Zambesi to Congo, and again from Loando to Quilimane on the Indian Ocean. In May, 1858, he started on a 5 years' expedition up the Zambesi and discovered Lake Nyassa. His third great journey was begun April 4, 1866. Stanley found him at Ujiji in autumn of 1871. He died in Chitambo's village in Ilala; was buried in Westminster Abbey, April 14, 1874. He visited England 1857 and 1864, each time publishing accounts of his travels. His *Last Journals* were issued 1874.

**Livius,** TITUS, or **Livy,** 59 B.C.–17. Roman historian, who was born at Patavium and lived at Rome. He wrote a history of Rome, in 142 books, from its foundation to 9 B.C.. It was

Livy.

afterward copied in sets of ten books, each called decades, of which we have books I.–X. and XX.–XLV., with an epitome of the rest. His style is generally praised and his fairness unimpeached. Dependent upon his authorities, his critical power is often defective, but the work is of supreme value.

**Livius Andronicus,** 3d cent. B.C. Earliest of Roman dramatists, and translator of the *Odyssey*. Only fragments remain.

**Livonia.** Russian province, on the Baltic; held by Teutonic knights 1237–ab. 1560, then by Poland, and by Sweden 1660–1721. Area 18,153 sq. m.; pop., 1890, 1,256,200.

**Livre.** Old French coin, varying in value, but latterly equivalent to the franc, which took its place 1795; also former unit of weight, somewhat above a pound avoirdupois.

**Lixiviation.** Process of separating a soluble from an insoluble material by a washing or filtering action. The leaching of ashes is an example.

**Lizard Point.** On s. coast of Cornwall, the southernmost point of Gt. Britain, with a lighthouse visible 21 m.

**Lizards.** See LACERTILIA.

**Lizard's Tail.** *Saururus cernuus.* Swamp plant of the natural family *Saururaceæ*, native of the U. S.

**Ljunggren,** GUSTAF HAKAN JORDAN, Ph.D., b. 1825; prof. at Lund 1847; historian of Swedish literature, 1873–76, and drama, 1864. *Æsthetic Systems*, 1869.

**Llama,** or LAMA. Domesticated Guanaco of Peru and

Llama.

Bolivia. The males are used as beasts of burden: they can carry nearly 200 lbs. and cover 6 to 12 miles a day. They are

allied to the camel, but lack the hump, and are smaller, being 8 ft. long and 4 ft. high at the shoulder. See TYLOPA.

**Llandovery.** Middle Silurian strata in Wales, contemporaneous with the Hudson, Medina, and Clinton of N. America.

**Llandudno.** Seaside resort 3½ m. n. of Conway, Wales. Pop. 6,100.

**Llano Estacado.** Plain or plateau in n. w. Texas and e. New Mexico; treeless and almost waterless. Elevation 3,500 to 4,500 feet, and ab. 400 by 100 miles in extent.

**Llanos.** Plains, usually covered with grass, in n. S. America. Such tracts, s. of the Amazon, are called Pampas.

**Llewelyn,** d. 1282. Welsh prince, long at war with the English.

**Llorente,** JUAN ANTONIO, 1756–1823. Spanish priest, Secretary-gen. to the Inquisition 1789–1801, and its historian 1817–18.

**Lloyd,** CHARLES HARFORD, b. 1849. English composer, organist at Gloucester Cathedral.

**Lloyd,** WILLIAM, D.D., 1627–1717. Bp. of St. Asaph 1680, Lichfield 1692, and Worcester 1699; writer on prophecy.

**Lloyd's.** Association of persons interested in marine insurance, meeting since 1774 in the Royal Exchange, London, as previously in Lloyd's coffee-house. It gathers and distributes shipping news, and exercises some supervision over the work of marine underwriters. *Lloyd's List* was a weekly devoted to shipping intelligence 1716–1800; since 1800 a daily.

**Llywarch Hen,** ab. 620. Welsh bard. *Elegies*, tr. 1792.

**Load Line.** Line marked on a ship, down to which the vessel may be loaded. See PLIMSOLL, SAMUEL.

**Loam.** The important component of ordinary soil, usually dark in color and consisting essentially of sand and clay in indefinite proportions, with the decomposed remains of vegetable matter, and salts of iron, calcium, potassium, and other chemical elements in small quantity, existing in such proportions that the soil is friable, easily worked, pervious to water, but sufficiently retentive not to suffer from drought, and that the fertility is readily given up to plants, but not easily leached out by water. It is the ideal soil. Loams are known as clay, sandy, or gravelly, as one or another of these constituents preponderate.

**Loan.** Delivery of personal property to be temporarily used by the borrower, generally for a compensation.

**Loanda,** ST. PAUL DE. Portuguese town in w. Africa, on

Loanda—General View.

Bengo Bay, ab. 200 m. s. of the Congo; founded 1578; long a center of the slave-trade. Pop. ab. 15,000.

**Loango.** District on w. African coast, between 3° and 5° S. lat. It belongs mostly to France, and has a trading-station, Loango.

**Loano,** or LOVANO. Village near Genoa, where the Austrians were defeated by the French under Masséna, Nov. 23, 1795.

**Loan-Words.** Borrowed from another language. Thus in Finnish are found words taken from the now extinct Gothic and the oldest Scandinavian. Modern borrowings are countless.

**Loasaceæ.** Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Dicotyledons*, comprising ab. 13 genera and 115 species, growing, with few exceptions, in the tropical and warm regions of America; called the Loasa family.

**Lobanoff-Rostovski,** PRINCE, 1825–1896. Russian ambassador at Constantinople, London, and 1884–95 at Vienna; Minister of Foreign Affairs 1895.

**Lobatæ.** Family of *Ctenophores*, having bodies compressed at ends of the funnel-axis, and a large lobe at each side of the mouth in the stomach-plane. The tentacle furrows are also stretched out, and in them are attached the tentacles whose branches show as numerous lateral tentacles projecting from the groove.

**Lobatchevski,** NICOLAI IVANOVICH, 1793–1856. Russian mathematician, prof. Univ. Kazan 1814, rector 1827–46. He developed the non-Euclidian geometry from Gauss' foundation, and in 1842 observed and described the solar corona.

**Lobati.** Swimming legs of birds that have the three anterior toes bordered by web-like lobes. A posterior toe is also present.

**Lobation.** System of division of leaves into lobes, or segments; known also as Segmentation.

**Lobau,** GEORGES MOUTON, COMTE DE, 1770–1838. French general 1805, prominent in the war with Austria and at Waterloo; exiled 1815–18; Deputy 1828, Marshal 1831.

**Lobe.** In Biology, rounded segment of an organ or organism.

**Lobeck,** CHRISTIAN AUGUST, 1781–1860. Greek prof. at Königsberg from 1814. *Aglaophamus*, 1829.

**Lobed Wheels.** Toothed or gear wheels, whose pitch lines are not circular, and which therefore transmit a periodically varying velocity to a follower from a uniformly revolving driving shaft. The conditions for the proper working of such wheels in pair or series are that all the wheels shall have a constant difference between the greatest and least radii, and that the points in the pitch lines shall be determined by means of an auxiliary drawing of an ellipse made in accordance with the imposed conditions as to inequality of radii and number of lobes. Elliptical wheels are one-lobed and turn round a focus; wheels of two or more lobes turn on a center, and are therefore balanced. Such wheels are used in textile machinery.

**Lobeira,** VASCO DE, d. ab. 1403. Supposed author of *Amadis of Gaul*, by some credited to his ancestor, João Pires, ab. 1300.

**Lobelia.** Genus of showy-flowered herbs of the natural family *Campanulaceæ*, of wide geographical distribution. They

Lobelia (*Lobelia inflata*).

are generally herbaceous or half shrubby. It is used as an emetic; the mere smell of a Chilian species excites vomiting. *L. inflata* is the Indian Tobacco of N. America.

**Lobelius,** or **de l'Obel,** MATTHIAS, 1538–1616. Flemish-English botanist. *Plantarum seu stirpium historia*, 1576;

*Plantarum seu stirpium icones*, 1581; *Stirpium illustrationes*, 1655.

**Lob Nor.** Shallow lake in the desert of Gobi, Turkestan.

**Lobo,** FRANCISCO RODRIGUES, d. ab.1625. Portuguese poet.

**Lobo,** JERONIMO, 1593–1678. Portuguese Jesuit, missionary in India 1621–25 and in Abyssinia 1625–35. His Travels were pub. in French 1673 and 1728, and abridged by Dr. Johnson 1735.

**Lobophora.** See CHARYBDEIDÆ.

**Lobosa** (AMŒBEA, AMŒBIFORMES). Group of fresh-water Rhizopods, whose pseudopodia are thick and blunt. There are two orders, AMŒBINA and ARCELLINA (q.v.).

**Lobos Islands.** Off the Peru coast; valuable for guano.

**Lobsters.** See HOMARUS.

**Lobule.** Diminutive of lobe.

**Local Action.** Production of small closed circuits in the active electrodes of a galvanic battery, due to the impurities it contains; destroyed by amalgamation.

**Localization.** Reference or projection of a sensation to some definite part of the body or to some point outside the body; *i.e.*, as a state of some external substance. The localization of cerebral functions is the residence of functional control of peripheral nerves and sense organs in limited areas of the brain cortex, in such a manner that artificial stimulation of such an area will produce movement or sensation referred to the end organ over which the area has control; and similarly, destruction of the area will produce paralysis of the corresponding end organ. Such limited cortical areas are called Centers; *e.g.*, visual and auditory center.

**Local Option.** Legislation authorizing a locality to decide a particular measure; *e.g.*, whether spirituous liquor shall be sold as a beverage.

**Local Signs.** Qualitative peculiarities of sensations by which one knows that the sensation has arisen in one part of the body and not in another; *e.g.*, when the back of the hand is touched, one knows that it is the back of the hand and not the top of the head where the sensation has originated. The nature of this local difference in the sensations is not understood.

**Locatelli's Lamp.** Small brass lamp burning olive oil, without a glass chimney, but having a reflector; used by Melloni in his experiments on radiation as one of the sources of heat.

**Locellus.** Diminutive of loculus.

**Loch Leven.** Lake 23 m. n. of Edinburgh, with an island on which Mary Stuart was confined July 1567–May 1568.

**Lochmaben.** Town in Scotland 10 m. n.e. of Dumfries, amid 7 lochs. Castle Loch contains the vendace, a fish which will not take bait. Here is the ruined castle of the Bruces. Pop., 1891, 1,500.

**Lochner,** STEPHAN (MEISTER STEPHAN), d. 1451. Painter of the School of Cologne, of the highest originality.

**Lock.** Well known contrivance to secure a door, lid or other object. The ancients do not seem to have been successful in locks; those of the Egyptians, Greeks and Romans being clumsy. The difficulty to be overcome in lock-making is to construct it so that it cannot be opened except by its own key nor admit of being picked. Therefore the interior of the lock is provided with wards and the key with clefts corresponding to them; no key can pass unless it has the proper clefts. Locks of a better kind have tumblers instead of wards; the tumblers being hinged pieces of metal within the lock which must be moved or raised before the key can act upon the bolt. The letter lock or combination lock has usually a number of rings placed with their plane surfaces in contact; every ring revolves on an axis; and the lock cannot be opened until all the rings are brought into exactly defined positions. Locks are also connected with clock work, so that they cannot be opened until a certain hour.

**Locke,** DAVID ROSS ("PETROLEUM V. NASBY"), 1833–1888. Ed. Toledo, O., *Blade;* political satirist.

**Lockjaw.** See TETANUS.

**Lock of a Gun.** Apparatus for lighting the charge. In the earliest muskets a slow-match was applied by hand to the powder in the touch-hole. See LINSTOCK, MATCHLOCK, FLINTLOCK, PERCUSSION CAP, BREECH-LOADING FIREARMS, MUSKET, RIFLE, FIREARMS. Modern firearms have locks peculiar to themselves.

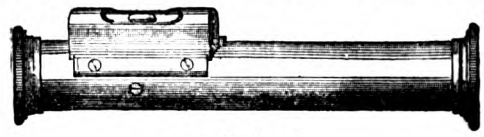
**Locke,** JOHN, 1632–1704. English philosopher and political writer; founder of the psychological and metaphysical reaction against apriori speculation. He denied the existence of innate ideas, limited the derivation of all knowledge to experience or sensation, and made all the higher conceptions of the understanding fictitious and unreal unless represented in sensation, except the ideas of God and causation. Thus both the

John Locke.

intellectual and the sensational elements were in his philosophy, leading on one side to the skepticism of Hume, on the other to the sensationalism of Condillac. *Essay on Human Understanding*, 1690; *Civil Government*, 1690; *Letters on Toleration*, 1689–1704; *Reasonableness of Christianity*, 1695.

**Locke,** JOHN, 1792–1856. Prof. of Chemistry in Medical Coll. of Ohio 1835; assistant on first geological survey of Ohio 1837; assistant to D. D. Owen in the survey of the mineral lands, and to C. T. Jackson 1847.

**Locke Level.** Hand level, invented by A. Locke, for use



Locke Level.

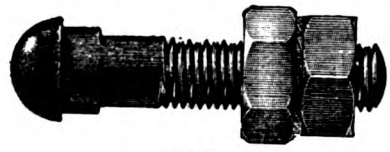
in surveying. It has a triangular prism which reflects the image of the bubble to the eye at the end of the telescope tube.

**Locker-Lampson,** FREDERICK, 1821–1895. English poet. *London Lyrics*, 1857; *Lyra Elegantiarum*, 1867; *Patchwork*, 1879; *My Confidences*, 1896.

**Lock Gates.** Gates for admitting water to and letting it out from a canal lock. The upper gate is usually hinged at the bottom, the lower ones on the sides. They are sometimes operated by water pressure.

**Lockhart,** JOHN GIBSON, 1794–1854. Scottish author, son-in-law and biographer of Sir Walter Scott; ed. *Quarterly Review*, 1826–53. *Peter's Letters*, 1819; *Valerius*, 1821; *Adam Blair*, 1822; *Spanish Ballads*, 1823; Lives of Burns, 1825, Napoleon, 1829, and Scott, 1837–38.

**Lock Nut.** Nut so arranged that it cannot be accidentally



Lock Nut.

loosened after being screwed fast. Of the numerous kinds in use, one is shown in the figure.

**Lockout.** Cessation of work in any establishment, where the initiative in the stoppage is taken by the employer. If he notifies his employés that at a given time they will all be discharged unless they submit to certain conditions, it is a lockout, while if the workmen declare their intention to stop work at a given time unless certain demands are complied with, it is a strike, though the original question at issue may be the same in both cases.

**Lockport.** Capital of Niagara co., N. Y., on the Erie Canal, which here passes a summit level, with 5 locks (60 feet) on each side. Pop., 1890, 16,038.

**Lockroy,** ÉDOUARD ÉTIENNE, b. 1838. Parisian journalist, Deputy 1871, Minister of State 1886–89.

**Lockwood,** BELVA ANN (BENNETT), b. 1830, m. 1868. Lawyer at Washington, D. C.; presidential candidate 1888.

**Lockwood,** JAMES BOOTH, U.S.A., 1852–1884. Arctic explorer 1882–84.

**Lockyer,** JOSEPH NORMAN, F.R.S., b.1836. English astronomer; ed. of *Nature*, 1864; author of many researches, especially in solar physics. *Star-gazing*, 1878; *Spectrum Analysis*, 1878; *Chemistry of the Sun*, 1887; *Dawn of Astronomy*, 1893.

**Locock,** SIR CHARLES, F.R.S., 1799–1875. English obstetrician, Baronet 1857.

**Locofoco.** Friction match of the past: nickname of Democrats 1835. At a meeting in Tammany Hall, New York, Oct. 29, the lights were extinguished, but the extreme or "Equal Rights" wing, who wished to continue the meeting, produced locofoco matches, relighted the hall, and resumed business.

**Locomotion** (OF ANIMALS). See MECHANICS, ANIMAL.

**Locomotion** (OF A SERPENT). See ABDOMINAL SCUTELLA.

**Locomotive.** Steam boiler and engine mounted on wheels for the purpose of pulling cars on a track. The first locomotives were designed for use on common roads, a patent for one being taken out by Trevithick in 1802. Later several were patented which ran on rack rails or chains, but about 1812 it was discovered that traction on a smooth rail was not difficult, if the locomotive had sufficient weight. In 1815 George Stephenson invented a method of increasing the draft by turning the exhaust steam into the smokestack, whereby a speed of six miles per hour was attained. Previous to 1829 the use of locomotives was confined to short lines for the transportation of coal from collieries. In that year, however, a railroad was constructed between Liverpool and Manchester, and the directors offered a premium for a locomotive to pull three times its own weight at a speed of ten miles per hour. In a trial between competing designs the locomotive Rocket, built by Stephenson, although weighing but 7½ tons, pulled 44 tons at a speed of 14 miles per hour. The first locomotive run in the U. S. was the Stourbridge Lion, imported from England, which was tried at Honesdale, Pa., on Aug. 8, 1829, by Horatio Allen. The first one built in the U. S. was by the West Point Foundry Co., for the South Carolina R. R. Co., which was run Nov. 2, 1830, on that road. A common passenger locomotive has four driving wheels; the Mogul locomotive, used for freight service, has six, and the consolidation locomotive, for heavy freight trains on steep grades, has eight; ten-wheeled locomotives have also been built. Passenger locomotives weigh about 45 tons, while freight engines are heavier, sometimes weighing as high as 100 tons. American locomotives commonly waste the exhaust steam, but European ones are mostly compound, there being two cylinders on each side, the larger of which uses the steam exhausted from the smaller. The American locomotive uses from 4 to 5 pounds of coal per horse power per hour, the compound from 2½ to 3 pounds. American locomotives pull longer and heavier trains than European ones. One of the heaviest trains in the U. S. (1892) had forty freight cars, weighing with the locomotive 2,015 tons. In 1893 a train of four passenger cars, weighing with locomotive 270 tons, ran one mile in 32 seconds, equivalent to 112 miles per hour. The power of a locomotive ranges from 500 to 1,200 horse-powers. On the average about one ton of coal is used for a run of 50 miles. The cost of pulling a train one mile averages about 15 cents. Oil has been used instead of coal, particularly for horseless carriages. The electric motor has been adapted to locomotives, the power being furnished through a trolley wire; the largest one, weighing 96 tons, was put into use in the belt tunnel at Baltimore in 1895.

**Locomotive Boiler.** Type which has been developed to meet the demand for rapid generation of steam with minimum weight and bulk as needed for railway traction; internally fired, to economize heat and to fill the condition of portability (see FIRE-BOX and BELPAIRE FIRE-BOX). The draft is artificial by a jet from the exhaust nozzles from the cylinder, and combustion is very rapid per sq. foot of grate surface. Over the fire-box the diameter of the shell curve is frequently enlarged, giving the wagon-top type, the waist of the boiler being that ring of plate which connects the cylindrical barrel to the fire-box end (see DOME). The tubes are small, to get great heating surface in compact space, but for this reason are not best suited for gaseous fuels. The smoke-box at the front end is much extended in present practice, to admit of putting in a netting below the exhaust nozzles to act as a spark arrester, the attempt being often made to equalize the draft in the tubes by the way in which the netting is inclined. A damper is often added, so that the draft can be moderated without impeding the exhaust from cylinders. The extended smoke-box diminishes back-pressure, since the exhaust escapes free beyond the retarding nettings of the arrester. Where it is not used, the stack has to be enlarged at its upper end, to admit of such appliances. The steam pipe to the cylinders is run inside the boiler from the dome, and comes out in the smoke-box. The ash-pit has dampers to close in snowy weather and in crossing timber structures. A special jet blower also is required to be used when the cylinders are not exhausting and to prevent back-draft into the cab. See BOILERS. STEAM.

**Locomotor Ataxia.** Chronic disease in which certain regions of the spinal cord harden with a consequent atrophy of nerve cells and fibers. The most marked symptoms are lightning-like pains, usually in the legs, contraction of the pupils, loss of the sexual power, and a peculiar gait due to loss of sensibility in the soles of the feet. Those seriously affected are unable to stand erect with the eyes closed or in the dark. It usually occurs between the ages of twenty-five and forty, rarely in women, and has been attributed to numerous causes, the most prominent being syphilis, alcoholic and sexual excesses, exposure to cold and damp and injuries. It is rarely, if ever cured, but often never advances beyond a certain point.

**Locris.** Two divisions of ancient Greece, Eastern L. on the coast s. from Thermopylæ, and Western L. on the Corinthian gulf. Locrians founded a colony in s. Italy 683 B.C., known as Locri Epizephyrii.

**Loculi.** 1. Vertical spaces between the septa of a coral. 2. Chambers of a polythalmous Foraminifer.

**Loculicidal.** In Botany, dehiscence or splitting of a seed-vessel into its cells or loculi, as in the Blue Flag.

**Loculus.** Cavity of an anther or ovary.

**Locus.** Geometric form wholly embracing any series of positions. Loci are linear, embracing a series of points; superficial, of lines; spatial, of surfaces. Non-Euclidian Geometry considers loci as occupying Hyperspace, as involving more than three dimensions. The Equation of a Locus is the expression in algebraic symbols of the law which controls its series of positions.

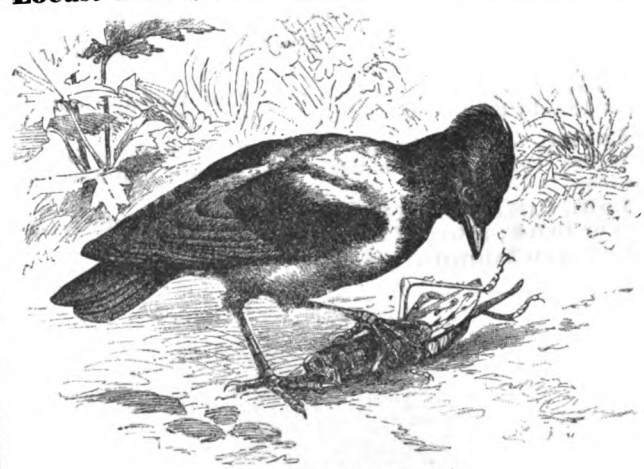
**Locust.** *Robinia pseudacacia.* N. American tree of the Bean family, native of the s.e. U. S., much valued for its timber, and extensively planted in Europe; known as False Acacia.

**Locust,** BRISTLY. See ROSE ACACIA.

**Locust,** HONEY. *Gleditsia triacanthos.* Spiny tree of the natural family *Leguminosæ*, native of the s. U. S., much planted for hedges and for ornament; called Three-thorned Acacia.

**Locust,** WATER. *Gleditsia monosperma.* Tall, thorny tree of the natural family *Leguminosæ*, native of the s. central U. S.

**Locust Bird** (PASTOR ROSEUS). Starling, living on the



Locust Bird (*Pastor roseus*).

steppes of w. Asia, and wintering in India. Its color is a glossy greenish black, with pink shoulders. It feeds on locusts.

**Locustidæ.** Orthopterous Insects allied to the Grasshoppers. They have long and slender antennæ. The females have a saber-shaped ovipositor. The katydid is a typical example. This large, green "grasshopper" lives amid the foliage of trees and shrubs and makes music at dusk with its stridulating apparatus. The eggs are laid on twigs in Sept. Early in

May the pupa-like larva hatches out, and moults, appearing on the stage of life as a young katydid ⅛ inch long, excluding legs and antennæ which are eight times the length of the body. Sexual maturity and wings are acquired late in June, the larval skin being cast off and eaten. In stridulating the male makes a longer note while gradually closing its wings. The female answers with a short note, produced by an upward jerk of the wings.

**Locusts** (GRASSHOPPERS). The largest is the Rocky Mountain locust, which may attain a length of 3 to 4 inches; its ravages are justly feared. When very abundant, other species

Locust (*Pachytylus migratorius*).

may do damage. They may be combated by spreading poisoned bran, by spraying Paris green, or by gathering in a "hopper-dozer," which is a large tray containing kerosene, that can be dragged over the ground. See ORTHOPTERA and ACRIDIIDÆ.

**Loddiges,** CONRAD. Nurseryman at Hackney, near London. *Botanical Cabinet, colored Delineations of Plants from all Countries*, 1818–24.

**Lode,** or LEAD. Mass of mineral filling a crack traversing the strata; form of ore-deposit occurring as a plate or sheet, relatively thin compared with its length and depth, intersecting the country rock; distinguished from a seam, which runs parallel with the strata; so named as leading or guiding the miner in his search for ore.

**Lodestone,** or LOADSTONE. $Fe_3O_4$. Natural magnet, or magnetic oxide of iron, possessing the property of attracting iron to itself. It is not a common mineral occurrence.

**Lodge,** EDMUND. 1756–1839. English antiquarian. *Illustrations of British History*, 1791; *Portraits of Illustrious Personages*, 4 vols., 1821–34.

**Lodge,** HENRY CABOT, b. 1850. M. C. from Mass. 1887–93; U.S. Senator 1893; biographer of G. Cabot, 1877, Hamilton, 1882, and Webster, 1883. *English Colonies*, 1881; *Studies in History*, 1884.

**Lodge,** OLIVER JOSEPH, F.R.S., b. 1851. Prof. of Physics at Univ. Coll., London, 1881. *Mechanics*, 1877; *Views of Electricity*, 1889.

**Lodge,** THOMAS, ab.1556–1625. English poet, dramatist, and romancer, "best of the Euphuists." His *Rosalynde*, 1590, was drawn upon by Shakespeare.

**Lodi.** Town of n. Italy, where the Austrians under Beaulieu were totally defeated by Napoleon, May 10, 1796. The battle opened Milan to the French. Pop. ab. 19,000.

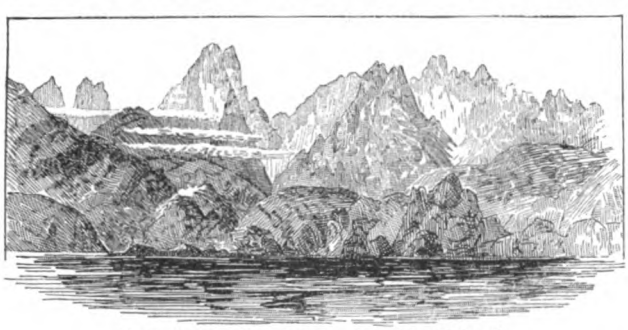
**Lodicules.** Scales in the flowers of grasses, borne at the base of the grain.

**Lodz.** Town of Poland, 76 m. s.w. of Warsaw; built up since 1820 by cloth-manufactures. Pop., 1893, 136,091.

**Loewe,** JOHANN CARL GOTTFRIED, 1796–1869. German organist, composer of ballads, symphonies, oratorios, and operas.

**Lofft,** CAPEL, 1751–1826. English lawyer and author, satirized by Byron; patron of Bloomfield.

**Lofoden Islands.** Group off the Norwegian coast, in lat.



Entrance of the Rafte-Sund, Lofoden Islands.

67°–69° 30′; rocky and mountainous, but important for their fisheries.

**Loft.** Uppermost room in a building, generally in the roof. Also any apartment used merely for storage.

**Log.** Instrument for measuring the velocity of a ship's motion. It consists of a wooden float attached to a line, marked by knots $\frac{1}{120}$ of a nautical mile apart. The number of divisions running out in ½ minute equals miles per hour. A metallic rotator with vanes is also used, the revolutions being communicated by the line to clockwork.

**Logan,** ab.1725–1780. Cayuga chief, peaceful till 1774, then hostile, from injuries and bereavement; alleged author of a noted speech.

**Logan,** BENJAMIN, 1752–1802. Pioneer settler and Indian-fighter in Ky.

**Logan,** JAMES, 1674–1751. Judge at Phila. 1715, Chief-justice 1731–39, Acting Gov. 1736–38; writer in English and Latin; founder of Loganian Library.—His grandson, GEORGE, M.D., 1753–1821, was U. S. Senator from Pa. 1801–7, and visited France 1798 and England 1810 in the interest of peace.

**Logan,** JOHN, 1748–1788. Scottish poet, who in 1781 pub. as his own the verses of his dead friend MICHAEL BRUCE (q.v.).

**Logan,** JOHN ALEXANDER, 1826–1886. M.C. from Ill. 1859–61 and 1867–71; Major-gen. U. S. Vols. 1862–65, serving with distinction in the West; U. S. Senator 1871–77 and from 1879; Republican candidate for Vice-Pres. 1884. *The Great Conspiracy*, 1886.

**Logan,** OLIVE (MRS. W. W. SIKES), b. 1841 in N. Y. Actress and author.—Her father, CORNELIUS AMBROSIUS, 1806–1853, was a playwright and theatrical manager.

**Logan,** SIR WILLIAM EDMOND, LL.D., F.R.S., 1798–1875. Geologist, who studied the coal fields of S. Wales, adding much to our knowledge of the nature and mode of formation of coal deposits; chief of the first Geological Survey of Canada 1842–70; knighted 1856. His labors in the Laurentides first made known the importance in American Geology of the ancient crystalline rocks.

**Logan,** MOUNT. In Canada, near the border of Alaska; lat. 60° 30′ N., long. 140° 24′ W.; surveyed 1892. Altitude 19,500 ft., being the greatest known in N. America.

**Loganiaceæ.** Natural family of flowering plants, of the class *Angiospermæ*, sub-class *Dicotyledons*, and series *Gamopetalæ*, comprising 34 genera and ab. 360 species, widely distributed throughout all parts of the tropics; called the Logania family.

**Logan's Cross Roads.** In s. Ky.; scene of a defeat of Confederates under Crittenden by Federals under Thomas, Jan. 19, 1862.

**Logansport.** Capital of Cass co., Ind., on the Wabash and Eel rivers. Pop., 1890, 13,328.

**Logarithmic Curve.** One which, referred to rectangular axes, is defined by either of the equations $y=\log x$, or $x=\log y$.

**Logarithmic Sines.** The Napierian logarithm developed $\log(1+x)=x-\frac{x^2}{2}+\frac{x^3}{3}-\frac{x^4}{4}+$ etc. This becomes the logarithmic sine for any base by multiplying by the modulus. This series is for the purpose of computing logarithms transformed to $\log(1+z)=\log z+2\left(\frac{1}{2z+1}+\frac{1}{3(2z+1)^3}+\frac{1}{5(2z+1)^5}+\text{etc.}\right)$, which converges rapidly.

**Logarithmic Spiral.** Curve generated by a point so moving on a revolving line that the logarithm of the point's distance varies as the angle of revolution. Its equation is $\theta=a\log\frac{\rho}{b}$, where a and b are arbitrary constants. $(\rho, \theta)$ the polar co-ordinates of the curve.

**Logarithms.** Exponents indicating the power to which a constant, called the base, must be raised to equal a given number. The base is positive and may be any number save zero or unity; there are therefore no real logarithms for negative numbers. A system of logarithms gives those of all numbers to a certain base. The constant factor dependent on the base, which enters every logarithm, is called the modulus of the system. Napierian logarithms assume the modulus as unity; the base thence derived=2.718271..... The symbol for the Napierian base is "e." This system is most available for analysis. Briggs logarithms assume ten as the base: the modulus is found=0.434294482..... This system, from its accord with the decimal scale, is most available for computations. Its logarithms have two parts, the integral, called Characteristic, and

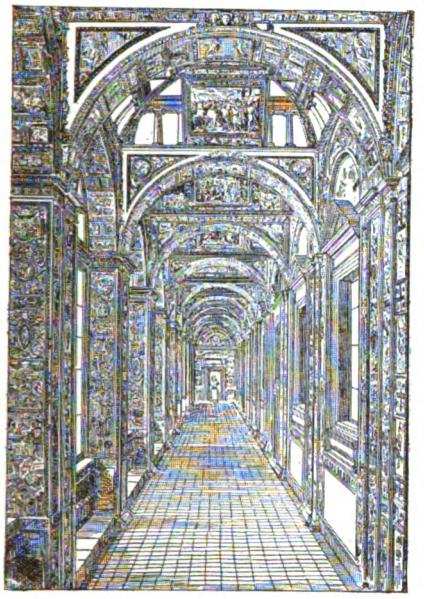
the decimal, called Mantissa. The Mantissa indicates merely the sequence of figures in relative value; and this only is given in the table. The characteristic shows the number of factors of ten, and indicates the position of the number in the decimal scale. Numbers are multiplied or divided by adding or subtracting their logarithms: any power or root of a number is taken, by multiplying or dividing the logarithm by the index.

**Logarithms,** GENERAL. Ordinary logarithms consider only real exponents of the given base, and are called arithmetical. Taking the Napierian base "e," exponents are obtained containing the imaginary unit, which satisfy the equation $e^y=x$: these are called algebraic logarithms. The general logarithm embraces negatives. It is much used in higher analysis, and yields many curious results.

**Log Board.** One on which are written down the transactions of a ship, and from which they are copied into the log book every 24 hours.

**Log Cock.** Pileated woodpecker; beautiful, large, and rare bird of Southern forests. The color of male is black, with white streak on neck, crest scarlet. Length 18 inches.

**Loggia.** Arcade inclosing an open room or passage; common in Italy. It is a favorite class of building in warm countries. The Loggie of the Vatican are ornamented with paintings and arabesques by Raphael and his pupils.



Loggia of the Vatican, Rome.

**Logic.** Science of the formal laws of reasoning, the principles that determine the legitimacy of inferences. Its subject-matter is composed of propositions and conceptions in any science whatever.

**Logistic.** Computations in which numbers are related by a scale of 60; sometimes called Sexagesimal Arithmetic.

**Logistic Logarithm.** Difference between the logarithm of one degree (3,600 sec.) and that of any number of seconds.

**Logocyclic Curve.** Locus of the foci of elliptical sections of a circular cylinder made by planes embracing a tangent to the cylinder parallel to its base. Its polar equation is $\rho=a.\sec.\theta(1\pm\mathrm{Sin}\theta)$.

**Logomachy.** Game played with squares of cardboard, on each of which is printed a letter of the alphabet, the object being to form them into words. It originated in Salem, Mass., ab. 1845, and has extended to Europe. It is known by a variety of names, as "Letters," "Word Making and Word Taking," etc. Somewhat similar games are played by children in school in e. Asia.

**Logos.** Divine Word, or Reason; term much used by the Jewish Platonist Philo, and applied to Christ by St. John, i. 1.

**Logwood.** *Hœmatoxylon campechianum.* Small tree of the natural family *Leguminosæ*, native of Central America and naturalized in the W. Indies, producing a deep red wood, from which the dye of commerce is derived. See HÆMATOXYLIN and HÆMATEIN.

**Löhe,** JOHANN CONRAD WILHELM, 1808–1872. German liturgist; founder of institutes for the training of missionaries and deaconesses.

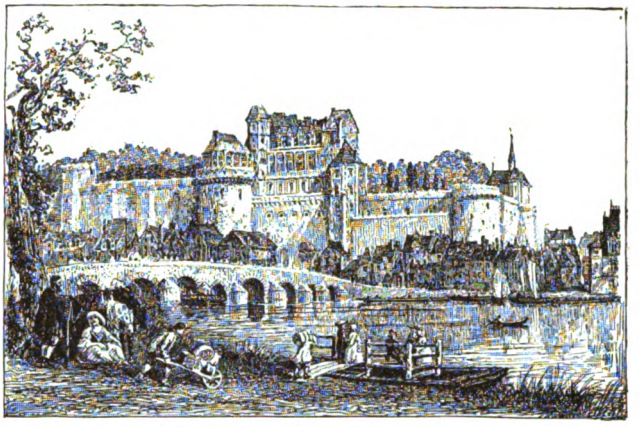
**Lohengrin.** In German legend, son of Parzival and one of Arthur's knights; celebrated in a poem of ab. 1290 and in Wagner's opera, 1848.

**Lohenstein,** DANIEL CASPAR VON, 1635–1683. German decadent poet.

**Löher,** FRANZ VON, 1818–1892. Prof. Munich 1855. *Geschichte der Deutschen in Amerika*, 1848; *Neapel und Sicilien*, 1864.

**Loins.** Portion of back and side between the lower ribs and hip bones.

**Loire.** River of France, heading in the Cevennes, whence it flows n.w. and w. to its mouth near Nantes. Length 620 m.;



Chateau of Amboise on the Loire.

drainage area 41,670 sq. m. It passes several of the chief French cities, and gives name to four departments.

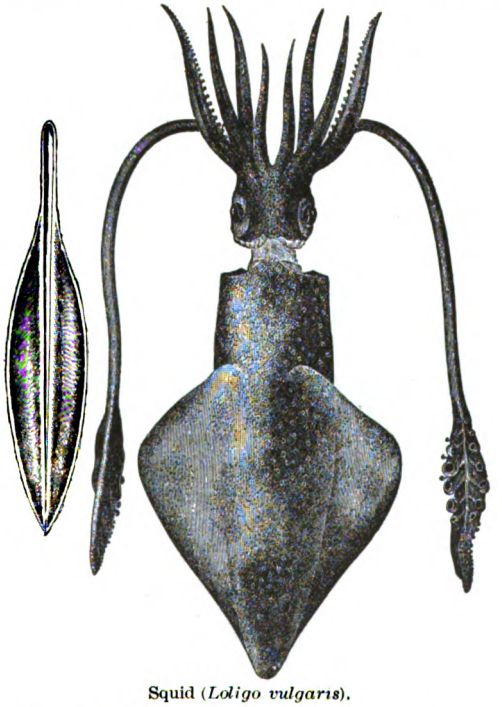
**Loiseleur-Deslongchamps,** JEAN LOUIS AUGUSTE, 1774–1849. French botanist. *Flora gallica*, 1806–7; *Herbier général de l'amateur*, 1816–27; *Histoire du cèdre du Liban*, 1837.

**Lois Weedon.** System of husbandry devised by Jethro Tull, whereby the land was divided into narrow strips, of which alternate ones were planted and the intervening ones kept thoroughly cultivated during the season. The following season the cultivated portion was planted and the other cultivated. Tull claimed that by this system there could be secured a crop equal in amount to that received from the whole area under ordinary circumstances, and that the practice could be maintained indefinitely. It has never come into general use in America.

**Loki.** In Norse Mythology, spirit of malice and mischief; bound with ten chains until the twilight of the gods appears; *i.e.*, the judgment.

**Lokman.** Arabic author of remote and uncertain date. The fables ascribed to him exist in many editions since 1615.

**Loligo** (SQUID). Cephalopod, of the division *Decapoda*, having a pinkish, elongated, and cylindrical body, pointed at



Squid (*Loligo vulgaris*).

the posterior end, where it is provided with two lateral folds or fins. It has eight short and two long arms furnished with suckers (acetabula) that have each a row of fine teeth around

the margin. A horny gladius (pen) is lodged in the mantle; sometimes several pens are present.

**Lollards.** (1) Flemish sect or order, beginning 1300; (2) and chiefly, followers of Wiclif, persecuted in England 1400–1431, but never extirpated.

**Löllingite.** $FeAs_2$. Iron arsenide, named from Lölling in Corinthia, where it is found associated with ores of iron and nickel.

**Lombard,** PETER, ab. 1100–1160. Italian schoolman, *Magister sententiarum*; Bp. of Paris 1159.

**Lombard Architecture.** Mode of building developed in n. Italy under the Lombards, who crossed the Alps 586. The chief monuments of the style date 1000–1200. It is the earliest of the Romanesque styles, containing reminiscences of classical Roman, Basilican and Byzantine architecture. The Roman columns are retained, but with a complete disregard of classical proportions, the diameter of a pillar being determined by its mechanical function, and the capitals sometimes reproduced from the antique, but oftener of original design and of barbarous or grotesque character. The chief innovations are the introduction of decorative arcades upon blank walls, the profuse use of decorative sculpture, and the employment of towers as belfries or campaniles. These were usually detached from the churches, and were independent of them in design. The style was developed in the 12th century architecture of the Rhine to more extensive and imposing examples than are to be found in Italy, but the Italian examples are richest in decoration. Among the most noteworthy of them are the Cathedral of Pisa, with its baptistery and campanile (the Leaning Tower), and the Church of St. Michael at Lucca. These are works of the 11th and 12th centuries, which marked the culmination of the Italian Romanesque. In the 13th century it was superseded by borrowing the pointed form of n. Gothic. See LEANING TOWERS.

**Lombardini,** ELIA, b. 1794. Italian hydrologist. He wrote on the hydrology of the Po and Tiber. Most of his writings appeared in scientific journals.

**Lombardo,** PIETRO, ab.1440–ab.1512. Italian sculptor and architect.

**Lombards.** Suevic people, from the Elbe, who moved s., adopted an Arian form of Christianity, occupied Pannonia, under Alboin, conquered n. and central Italy, 568–570. The code of King Rothari, 643, formed basis of German constitutional law in the Middle Ages. L.'s reached the height of power and prosperity under Liutprand, 712–744, who sought to extend his sovereignty over Italy. The alliance of the popes with the Frankish kings led to the invasion of Italy by Pepin, 754. Charlemagne overthrew Lombard dominion 774, and the Lombard system of government was supplanted by that of the Franks. The German emperors regarded it as an honor to receive the IRON CROWN (q.v.) of Lombardy.

**Lombard University.** At Galesburg, Ill.; founded 1851 as a Universalist school; enlarged 1855. It is coeducational, includes a theol. sem. and a preparatory department, and has, 1896, in all 179 students.

**Lombardy.** Region of n. Italy between Venetia and Piedmont; held by the Franks 774–843; by 961 divided into small states, which warred with each other and with the German emperors, but made rapid progress in civilization; long held in part by Spain, and by Austria 1713–96 and 1815–59.

**Lombok.** One of the Sunda Islands, e. of Java; held by the Dutch. Area 2,100 sq. m.; pop. ab. 300,000.

**Lombroso,** CESAR, b. 1836. Prof. Pavia and Turin; prolific writer on criminology and mental disorders. His most noted work, *The Criminal*, 1875–89, treats crime as the product of disease. Some of his views have been carried to an extreme by his disciple, Nordau.

**Loménie,** LOUIS LÉONARD DE, 1815–1878. French biographer, Academician 1871. *Beaumarchais*, 1855; *Mirabeau*, 1879.

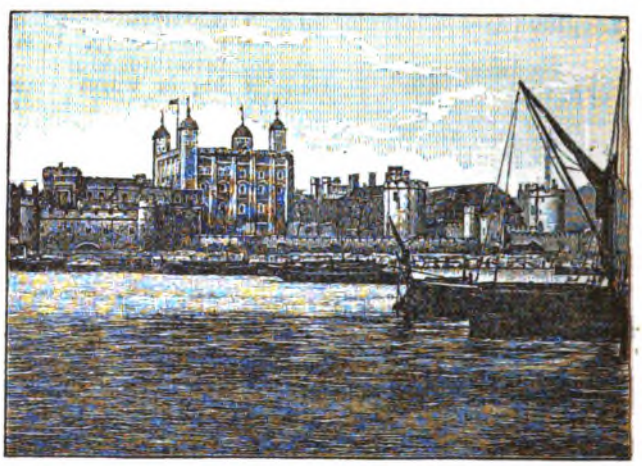
**Loment.** Apocarpous dry fruit or pod, composed of numerous indehiscent one-seeded joints; modification of a legume, found in many plants of the Pea family.

**Lomond,** LOCH. Largest lake of Scotland, 16 m. n.w. from Glasgow, emptying its water into the Frith of Clyde. Area 27¼ sq. m., greatest depth 630 ft.

**Lomonosoff,** MIKHAEL VASILEVICH, 1711–1762. Russian poet and grammarian, regarded as a reformer of the language.

**Lonato.** Town of n. Italy, 12 m. e. of Brescia: scene of a defeat of Austrians under Wurmser by Bonaparte, Aug. 3, 1796.

**London.** Metropolis of England and largest city in the world; on both banks of the Thames, 50 m. from its mouth. It is very irregularly planned, many of its streets being narrow and crooked; the pavements have been much improved. The water supply comes in part from the Thames, in part from smaller streams and springs. The sewage, upon which vast sums have been spent, is unsatisfactory. It is the chief commercial and manufacturing city of the world, and almost equally prominent in its institutions of learning and art. It was used as a fortified camp by the Romans; was destroyed by Boadicea; was restored, and grew in importance; was occupied by the Saxons by 600: taken and plundered by Danes 851; recovered by Alfred 886, who rebuilt its walls. William the Conqueror began a citadel on the site of the tower and granted a charter, still extant; the first real charter was given by Henry I. Several charters were granted by John; Magna Charta guaranteed all its ancient privileges. Under the Plantagenets two-thirds of its area was occupied by convents and hospitals. It was attacked 1471 by T. Neville, and threatened by the rebels under Perkin Warbeck 1497. Under the Tudors, the religious houses were suppressed, and some of them converted into hospitals and almshouses. The plague broke out Dec. 1664, and destroyed near 100,000 of ab. 500,000. In Sept. 1666 a fire raged five days and destroyed most of the city, which was rebuilt on the old lines with brick and stone instead of timber. The city proper has been almost entirely reconstructed since 1800. The present area comprises 74,672 acres.



The Tower of London from the River.

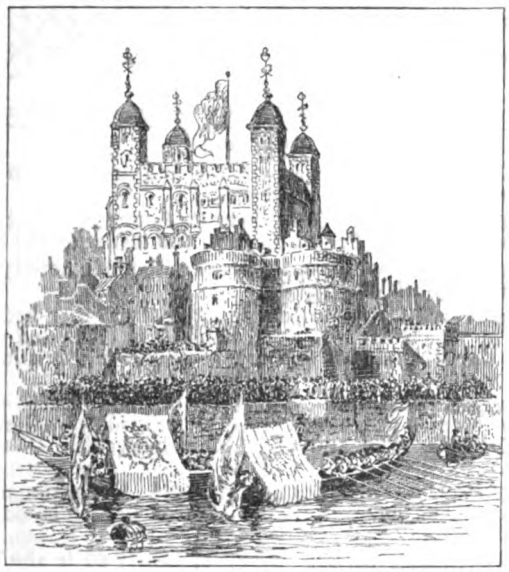
The Police District, "Greater London," includes 443,421 acres, or ab. 690 sq. m. The Common Council consists of 206 members who, with the Lord Mayor (elected by trade guilds) and 26 aldermen, manage city affairs. L. sends 61 members to House of Commons. The streets, with lanes and courts, aggregate ab. 30,000 miles. Underground railways traverse the city. The Thames is crossed by 13 bridges, besides 5 for railways. The Thames Tunnel is now part of the East London railway; a tunnel for carriages is under construction; there are also 3 subways for foot passengers. The Thames Embankment affords a spacious thoroughfare. Near the bridges are 20 steamboat piers; extensive docks on either side of the river accommodate shipping. Ab. 100 vessels enter the port daily. Among important buildings are the House of Parliament, with a river-front of 900 ft.; Westminster Hall, Buckingham Palace, Marlborough House, the various government offices, the General Post-office, Bank of England, Royal Exchange, British Museum, National Gallery, the Tower, St. Paul's Cathedral, and Westminster Abbey. The Trade Guilds, 76, do not now exert the influence they once had. Besides numerous squares, there are 12 extensive parks. Pop., 1891, 4,211,743; Police London, or Metropolitan Area, within 12 m. of Charing Cross, 5,633,806.

**London.** Capital of Middlesex co., Ontario: on the Thames, at the junction of its two branches, 116 m. s.w. of Toronto. It is a port of entry, seat of Anglican and R. C. bishops, and has several colleges. Pop., 1891, 31,977.

**London,** CONFERENCE OF. April, 1864; between the Great Powers, who agreed upon the separation of Holstein, Lunenburg, and s. part of Schleswig from Denmark.

**London,** TREATY OF. 1. July 6, 1827, between England, Russia and France, founding the kingdom of Greece. 2. April 19, 1839, Netherlands secured right of levying 2s. 6d. per ton on all vessels navigating lower Scheldt (see BRUSSELS, TREATY OF). 3. Between Russia, Prussia, Austria, and England; signed July 15, 1840. It restored Syria and Candia to Turkey. 4. Between Austria, France, England, Prussia, Russia, and Sweden; signed May 8, 1852. The dominions of Denmark were to fall to Prince Christian of Glücksborg. The Duke of Augustenborg relinquished, for a consideration, his claim to Schleswig and Holstein. The rights of the German Confederation were not affected.

**London,** TOWER OF. On left bank of the Thames, e. of city; begun 1079 by William I., who built the White Tower; continued by William Rufus, who built the St. Thomas Tower and Traitor's Gate. It now occupies 13 acres, is surrounded by

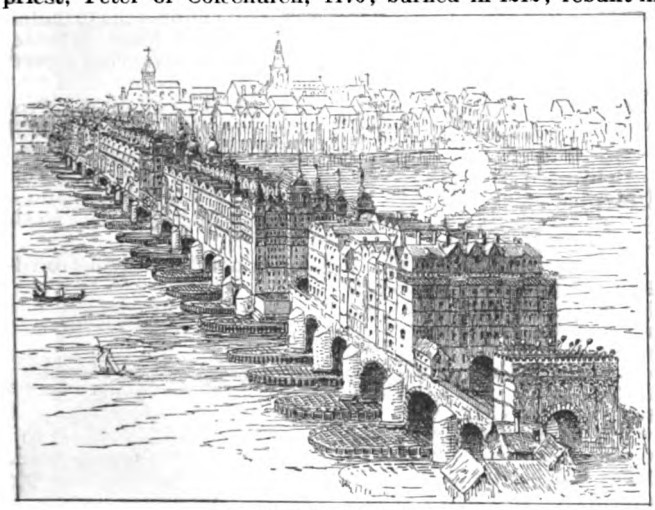


The Tower.

a moat, inclosing a double line of fortifications, and contains a large collection of armor and the regalia of England. It has been used as a palace, and as a prison; executions have taken place within its inclosure.

**London,** UNIVERSITY OF. Incorporated 1837 simply to hold examinations and grant degrees. With it are connected University Coll., unsectarian, chartered 1826, opened 1828, and King's Coll., Anglican, opened 1831. Many others, in arts and medicine, have since been affiliated with it. A new charter, granted 1858, was amended 1863.

**London Bridge.** Over the Thames; first built by a priest, Peter of Colechurch, 1176; burned in 1212; rebuilt in



London Bridge ab. 1616.

1300; again burned 1471 and 1725. The present bridge was built 1831.

**London Clay.** Stratum of the Eocene period in England. See EOCENE.

**Londonderry,** or DERRY. City of n. Ireland, on the Foyle; noted for the manufacture of linen; besieged 105 days by James II. 1689. Pop., 1891, 32,893.

**Londonderry,** CHARLES WILLIAM STEWART VANE, 3d MARQUIS OF, 1778–1854. Irish soldier, M.P. 1801; prominent in Spain 1808–13; envoy to Berlin and Vienna 1813–15; Baron Stewart and Lieut.-gen. 1814; took the name of Vane 1819; Marquis 1822, succeeding his brother, LORD CASTLEREAGH (q.v.); Earl Vane 1823. *Hist. Peninsular War.*

**London Fog.** Dry fog, peculiarly dense in the heart of London or other cities where soft coal is burned and the smoke combines with the fog proper. Apparently each particle of carbon attracts aqueous vapor to it and adds to the opacity of the atmosphere.

**London Pride.** *Saxifraga umbrosa.* Showy-flowered herb of the natural family *Saxifragaceæ*, native of Europe; cultivated for ornament.

**Lone Star State.** Texas, which adopted 1836 a flag bearing a single star.

**Long,** CHARLES CHAILLÉ, b. 1842. American officer in Egypt 1869–77; U. S. Consul in Corea 1887. *Central Africa*, 1877; *Three Prophets*, 1884.

**Long,** CRAWFORD W., M.D., 1815–1878. Physician in Ga.; first to use sulphuric ether (1842) in operations. His discovery was not published till 1849, after it had been made by others. See ETHER.

**Long,** EDWARD, 1734–1813. English historian of Jamaica, 1774.

**Long,** GEORGE, 1800–1879. Prof. of Classics in London 1828–31, 1842–46, and at Brighton 1849–71; ed. *Penny Cycl.*, 1832–46, *Bibliotheca Classica*, begun 1850, and other works; tr. *Marcus Aurelius*, 1862, and *Epictetus*, 1877. *Decline of Roman Republic*, 5 vols.

**Long,** STEPHEN HARRIMAN, U.S.A., 1784–1864. Explorer of the West 1818–23; surveyor Baltimore and Ohio R.R. 1827–30; chief of U.S. Topographical Engineers 1860. He improved the Mississippi and other rivers, and did much for railroads.

**Longan.** *Nephelium longan.* Small tree of the natural family *Sapindaceæ*, bearing an edible fruit similar to the Litchi; native of China.

**Long Branch.** Town of Monmouth co., N. J., on the coast, 12 m. s. of Sandy Hook; long famed for its bathing. Pop., 1891, 7,231, often quadrupled in summer.

**Longchamp.** Parisian racecourse, on s. w. side of the Bois du Boulogne; formerly a fashionable drive and promenade; site of a noted convent 1260–1793.

**Longchamp,** WILLIAM DE, d. 1197. Bp. of Ely 1189, Chancellor 1194; favorite of Richard I., but not of the people.

**Longet,** FRANÇOIS ACHILLE, 1811–1871. Prof. of Physiology in Paris. *Système Nerveux*, 1842; *Physiologie*, 1850–59.

**Longevity** (LENGTH OF LIFE). Thomas Parr is said to have lived 152 years, Henry Jenkins 169, and Countess of Desmond 140, but there is no satisfactory evidence of this, nor of any lives as extended; there is no scientific evidence that human life was longer in ancient times than at present. Owing to the improvement in hygienic conditions, human life in civilized countries has been increasing in length for several centuries.

**Longfellow,** HENRY WADSWORTH, D.C.L., 1807–1882. American poet, eminent for purity, refinement, simplicity, and wide acquaintance with European literatures; Prof. Harvard 1836–54. Besides a great number of beautiful lyrics, he pub. *The Spanish Student*, a drama, 1843; *Evangeline*, 1847; *The Golden Legend*, 1851; *Hiawatha*, 1855; *Miles Standish*, 1858;

Henry Wadsworth Longfellow.

*Tales of a Wayside Inn*, 1863–72; *New England Tragedies*, 1869; *Christus*, 1872; of translations, *Poets and Poetry of Europe*, 1845, and Dante's *Divine Comedy*, 1867–70; and in prose, *Outre Mer*, 1835, *Hyperion*, 1839, and *Kavanagh*, 1849. His *Life* was pub. 1886 by his brother, SAMUEL, 1819–1892, Unitarian minister at Brooklyn 1853–60 and Germantown, Pa., 1878–83, whose hymns and poems were collected 1894.

**Longhi,** ALESSANDRO, 1733–1813. Venetian painter.

**Longhi,** GIUSEPPE, 1766–1831. Italian engraver.

**Longhi,** LUCA, 1507–1580. Italian painter.

**Longicornia.** See TETRAMERA.

**Long Inequalities** IN PLANETARY MOTIONS. These result from approximate commensurability in the periods of two planets: thus 235 revolutions of the earth about the sun are accomplished in nearly the same time as 382 of Venus, producing an inequality in the motions of both planets, having a period of 235 years. So 77 revolutions of Jupiter are nearly equal to 31 of Saturn, producing an inequality of 913 years.

**Longinus,** DIONYSIUS CASSIUS, ab.213–273. Greek philosopher, rhetorician at Athens and Palmyra; put to death by Aurelian as adviser of Zenobia's revolt. The noted treatise, *On the Sublime*, long ascribed to him, is of doubtful authorship.

**Longipennes** (LONGIPENNATI, CECOMORPHÆ, GAVIÆ). Order of Birds, equivalent to a portion of the Natatores; including Petrels, Gulls, Terns, etc. See LARIDÆ. The group is subdivided into the Tubinares and Longipennes proper. To the former belong the Albatrosses and the *Procellariidæ*.

**Longirostres.** See LIMICOLÆ.

**Long Island.** Off the coast of Conn., between the Sound and the Atlantic; comprising 3 counties of N. Y. Length 118 m., width 12 to 24 m.; area 1,682 sq. m. Pop., 1890, 1,029,097, chiefly in Brooklyn and other suburbs, now part of New York City. The Shinnecock Indians, near the e. end, are the chief survivors of the original inhabitants. Settlement by whites began with the founding of New York.

**Long Island,** BATTLE OF. Aug. 27, 1776, on the site of Brooklyn. The Americans under Gen. Putnam were defeated, and left the island to the British.

**Long Island City.** In Queens co., N. Y., n. of Brooklyn; incorporated 1870, annexed to New York 1896. It has large oil-refineries and other manufactures. Pop., 1890, 30,506.

**Long Island Sound.** Body of water between Conn. and Long Island. Length ab. 115 m., width ab. 20 m.

**Longitude,** LENGTH OF A DEGREE OF. This decreases northward, being 365,229 feet at the equator and nothing at the poles.

**Longitude,** METHODS OF DETERMINING. Any process by which the difference in the local time at two places can be found gives the difference of longitude. This may be done by transporting chronometers, by observation of the moon's position, by eclipses of the sun, moon, or Jupiter's satellites, or, best of all when practicable, by the electric telegraph. Till 1750 or later, no practical method was known for determining the longitude at sea. Navigators depended almost exclusively on their dead reckoning, which in case of long voyages was frequently in error by hundreds of miles. In 1714 a commission was appointed by the English government for the discovery of the longitude at sea. This commission continued in existence until 1828. Rewards of £10,000, £15,000, and £20,000 were offered for a practical method of determining the longitude within 60, 40 and 30 miles respectively. The maximum award of £20,000 was paid to John Harrison for improvements in chronometers (£10,000 in 1765, £10,000 in 1773). £3,000 was paid to the widow of Tobias Mayer for improved lunar tables. Smaller sums were awarded from time to time for encouragement of research and invention. In all the commission expended £101,000, much of which was wasted, as is usually the case with Government commissions.

**Longitude,** TERRESTRIAL. The longitude of a point on the earth is referred to some prime meridian, as Greenwich or Washington. It is the angle at the pole between this prime meridian and the meridian passing through the place.

**Longitude of a Star,** CELESTIAL. Angular distance measured on the ecliptic from the first point of Aries to the point where it is intersected by a great circle passing through the star perpendicular to the ecliptic.

**Longmans.** London publishing house, founded ab. 1665, and prominent from 1726.

**Longobardi.** See LOMBARDS.

**Long Parliament.** In session Nov. 3, 1640–April 20, 1653, when it was summarily dissolved by Cromwell. Ninety-six members were ejected by "Pride's Purge" 1648; 60 remaining, the "RUMP" (q.v.), voted the trial of Charles I. 1649.

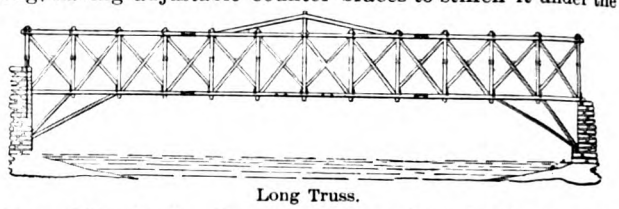
**Long's Peak.** In the Colorado range, Col. Ht. 14,271 ft.

**Longstreet,** AUGUSTUS BALDWIN, 1790–1870. Judge in Ga. 1822, M. E. minister 1838, pres. of colleges in Ga., La., Miss., and S. C. His humorous *Georgia Scenes*, 1840, was long popular.—His father, WILLIAM, ab.1760–1814, had a plan for steamboats 1790, before Fulton's, and invented the breast-roller for cotton-gins.

**Longstreet,** JAMES, b. 1821. U.S.A. 1842–61; Confederate general 1861–65, prominent at 2d Bull Run, Antietam, Gettysburg, Chickamauga, and in other battles; U.S. Minister to Turkey 1880–81. *From Manassas to Appomattox, Memoirs*, 1896.

**Long Tom.** Wooden trough, ten or twelve feet long and ab. two feet wide, once extensively used in Cal. gold washing.

**Long Truss.** Bridge truss, invented 1836 by Col. C. H. Long, having adjustable counter braces to stiffen it under the



Long Truss.

action of live loads. It was wooden, and used only for short spans on early American railroads.

**Longueville,** ANNE GENEVIEVE DE BOURBON-CONDÉ, DUCHESSE DE, 1619–1679. Foe of Mazarin and leader of the Fronde.

**Longus,** perhaps 5th cent. Greek author of a noted pastoral romance, *Daphnis and Chloe*.

**Long Wall.** System of mining coal or other bedded deposits, in which the whole of the bed is taken and the roof behind the workings is supported by stowing or allowed to fall in.

**Lönrrot,** ELIAS, 1802–1884. Prof. Helsingfors 1853–62; collector of Finnish folk-songs, proverbs, and riddles, editor of the epic *Kalevala*, 1835, and of a Finnish-Swedish Dictionary, 1874–80.

**Lonyay,** MEINHARD, COUNT, 1822–1884. Hungarian minister of finance 1867–70, Premier 1871–72; writer on banking and political economy.

**Loo Choo Islands.** Group of nearly 60 in the Pacific, between Japan and Formosa; held by Japan. The people are Buddhists, of a race allied to the Japanese, of mild character, with some peculiar customs. Area ab. 1,000 sq. m.; pop. ab. 375,000.

**Looking Glass.** See MIRROR.

**Lookout,** CAPE. On N. C. coast.

**Lookout Mountain.** In Tenn.; scene of a victory, Nov. 23–25, 1863, won by 80,000 Federals under Grant, Sherman, Thomas, and Hooker, over 50,000 Confederates under Bragg and Breckenridge. Union loss 757 killed, 4,530 wounded; Confederate loss 4,000 killed and wounded, 6,140 prisoners, 40 guns.

**Loom.** Machine employed by weavers for crossing and weaving threads. In the oldest Egyptian pictures the principle of its action is discernible. The Jacquard loom, invented toward the end of the last century, is used for weaving figured goods. See WEAVING.

**Loomis,** ALFRED LEBBEUS, M.D., LL.D., 1831–1895. Prof. New York Univ. 1867. *Fevers*, 1882; *Practical Medicine*, 1884.

**Loomis,** ELIAS, LL.D., 1811–1889. Prof. of Natural Philosophy at Western Reserve Coll., Hudson, O., 1837, New York Univ. 1844, and Yale 1860; author of sundry text-books and of many investigations. Most of his estate he bequeathed to the Observatory of Yale.

**Loons** (URINATORIDÆ). Natatorial northern diving birds, living in solitary pairs, breeding on fresh-water shores, but retiring to the seashore at other seasons. They lay dark olive eggs on the ground. The feet are set far back; the hind toe is small. They can hardly walk, but are good flyers. The Great Northern Loon is 3 ft. long, has head glossed with green, and two black collars around the neck. The breast and abdomen are white. The back is black, spotted with white in summer. The Black-throated and the Red-throated Diver are thus colored in the summer; length 27 inches.

Great Northern Loon (*Urinator imber*).

**Loop,** or VENTRAL SEGMENT. Portion of a vibrating string or rod between two successive nodal points, or points of rest.

**Loosestrife.** 1. Herbs of the genus *Lysimachia*, yellow-flowered plants of the Primrose family, natives of the n. hemisphere. 2. Genus *Lythrum;* purple-flowered plants of the natural family *Lythraceæ*, of the same geographical distribution.

**Loosestrife,** FALSE. Herbs of the genus *Ludwigia*, swamp plants of the Evening Primrose family, natives of America.

**Loosestrife,** SWAMP. *Decodon verticillatum*. Red-flowered

shrub of the natural family *Lythraceæ*, growing in swamps in e. N. America.

**Loosjes,** ADRIAAN PIETERSZOON, 1761–1818. Dutch novelist and poet. *Maurits Lijnslager*, 1808.

**Lopes,** CÆTANO, 1780–1860. Brazilian historian and geographer.

**Lopes,** or **Lopez,** FERNAO, ab.1380–ab.1460. Portuguese chronicler.

**Lopez,** CARLOS ANTONIO, 1790–1862. Paraguayan ruler of great ability, who succeeded Francia 1840 as nominal pres., but practical dictator. He advanced the material interests of Paraguay very greatly by his administration, which was in the main patriotic. His work was undone by his son and successor, FRANCISCO SOLANO, 1827–1870, who from 1864 waged an unequal war with Brazil and Argentina, impoverishing his country.

**Lopez,** ESTANISLAO, 1786–1838. Argentine general.

**Lopez,** NARCISO, 1799–1851. Venezuelan soldier, in Spain 1823–41, then in Cuba, and from 1849 in the U. S., whence he made three attacks on Cuba. These failed of support, and he was executed in Havana with many of his followers.

**Lopez de Zuniga y Velasco,** DIEGO, 1510–1564. Viceroy of Peru 1561.

**Lopez y Planes,** VICENTE, 1784–1856. Argentine poet and Minister of State.

**Lophiodont.** See LOPHODONT.

**Lophius.** Pediculate fish, having an enormous mouth, and on top of the head an imitation of an angler's pole and line with bait, supposed to serve as a lure; but the entire form and coloration of the animal shows that it mimics a rocky, weed-grown bottom, so that its prey run close enough to be caught, without perceiving the danger. The eggs are laid in long ribbons containing 40,000 or more. See ACANTHOPTERI.

**Lophobranchii.** Sub-order of physoclist fishes, characterized by an armored skin, a tubular snout without teeth, narrow gill-slits, and gills in the form of tufts. The *Syngnathidæ* have nearly cylindrical body and small pectoral fins. The males are provided with brood pouches under the belly. Here belong the Pipe-fish (*Syngnathus*), shaped like a narrow stem, and *Hippocampus*, the Sea Horse, resembling the head and neck of a horse anteriorly and tapering off posteriously into a slender tail, which the animal winds about the stems of sea weeds, which, in form and markings, he mimics. *Pegasus* (from another family in this group) has a flattened body and large pectoral fins spread out like wings.

**Lophodont Dentition.** Molar teeth of mammals whose flat crowns are thrown into shallow transverse or longitudinal folds and ridges, as in the higher Ungulates. They may be ANTIODONT (q.v.) as in the Selenodonts (Ruminants), Tapirodonts (Tapir, Rhinoceros), and Trichechodonts (Elephant, Manatee, and Kangaroo), or may be AMŒBODONT (q.v.).

**Lophophore.** Disk on which the tentacles of *Polyzoa* are borne.

**Lophopoda.** See PHYLACTOLÆMATA.

**Lophyropoda.** See ENTOMOSTRACA.

**Lopseed.** *Phryma leptostachya.* Insignificant woodland plant of the natural family *Verbenaceæ*, native of N. America and Asia.

**Loquat.** *Eriobotra japonica.* Tree of the Apple family, native of e. Asia; cultivated for its fruit, which is the size of a small plum, and has the flavor of an apple.

**Loranthaceæ.** Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Dicotyledons*, comprising 13 genera and ab. 520 species, distributed through the tropical regions of the earth; mostly parasitic on trees and shrubs; called the Mistletoe family.

**Lord,** ELEAZAR, LL.D., 1788–1871. Banker in New York; writer on finance, railways, and religion, especially prophecy.

**Lord,** JOHN, LL.D., 1812–1894. American lecturer and writer on history.—His uncle, NATHAN, D.D., LL.D., 1793–1870, was pres. of Dartmouth Coll. 1828–63.

**Lord-Lieutenant.** In Ireland, viceroy; in each English county, governor and chief magistrate; appointed by the crown.

**Lord of the Isles.** Title assumed 1344 by John Macdonald, who controlled Mull, Skye, Islay, and other islands w. of Scotland. Its glory ended with the outlawry of his great-grandson for treason 1481.

**Lords,** HOUSE OF. See PARLIAMENT.

**Lord's Day.** Sunday, first day of the week; so called by Ignatius and other early writers, as the day of Christ's resurrection.

**Lords of the Congregation.** Association of Scottish nobles in the reign of Mary Stuart, headed by her half-brother James, which secured the victory of Protestantism.

**Lord's Prayer.** Model given by Christ to His disciples, Matt. vi. 9–13, Luke xi. 2–4; basis of all Christian forms of devotion.

**Lord's Supper.** Sacrament instituted by Jesus on the evening before His death; observed under varying forms by nearly all Christians, in every age and land, as the chief rite of their religion; called also Eucharist and Holy Communion. Its doctrine, as the central one of theology, has been variously interpreted and has given rise to many controversies and schisms. The refusal of the cup to the laity led to the Hussite secession and bore part in causing the Reformation.

The Last Supper, by Leonardo da Vinci.

**Lorelei.** Siren of modern German legend, celebrated by Heine and other poets and romancers; supposed to dwell on a lofty rock on the Rhine, near St. Goar, and by her singing to lure boatmen to their death in a whirlpool below.

**Lorenzetti,** AMBROGIO and PIETRO, 14th cent. Sienese painters. The great frescoes in the Chapel of the Spaniards in Maria Novella at Florence, as well as the *Triumph of Death and Last Judgment*, in Pisa, have been lately ascribed to them. Their style and art were based on Giotto.

**Lorenzo.** See MEDICI.

**Loreta,** PIETRO, 1831–1889. Prof. of Surgery at Bologna 1868; eminent operator and professional writer.

**Loreto,** or LORETTO. Town of e. Italy, 15 m. s. e. of Ancona, containing the Santa Casa or Virgin's house from Naz-

areth, supposed to have been transported thither by angels 1291–95; visited annually by hosts of pilgrims.

**Loreto,** SISTERS OF. R. C. order for charitable work, founded 1812 in Ky.

**Loricata** (DASYPODIDÆ, MACROTHERIIDÆ, GRAVAGRADA, ARMADILLOS). Suborder of *Edentata*, in which the body is covered with long plates arranged in transverse rows on the back and tail. They have a large number of molar teeth, but usually no canines or incisors. Some species can roll themselves up so as to be inclosed by their dermal armor. The legs are fitted for digging, as they are burrowing animals. They are all S. American. See GLYPTODON and CROCODILIA.

**L'Orient.** Seaport of France, on the Bay of Biscay, at the mouth of the river Scorf; founded 1664; naval station, with large shipyards. Near it the British defeated a French fleet, July 23, 1795. Pop., 1891, 42,116.

**Lorimer,** JAMES, 1818–1890. Law prof. Univ. Edinburgh 1862. *Law of Scotland*, 1862; *Institutes of Law*, 1872.

**Loring,** GEORGE BAILEY, M.D., 1817–1891. U. S. Commissioner of Agriculture 1881–85; Minister to Portugal 1889–90. *A Year in Portugal*, 1891.

**Loring,** WILLIAM WING, 1818–1886. Officer U.S.A. 1837–61; Major-gen. C.S.A. 1862–65; in Egyptian army 1869–79. *A Confederate Soldier in Egypt*, 1883.

**Lorinser,** KARL IGNAZ, 1796–1853. Bohemian physician and author.—His son, FRANZ, b. 1821 in Berlin, is a writer and translator.

**Loris.** Slow lemur of Ceylon, characterized by a rudimentary index finger, short tail and ears, limbs nearly equal

Loris.

in length, and large eyes. It is active at night, but creeps slowly toward a sleeping bird until it can be seized with the hand.

**Lorne,** JOHN GEORGE CAMPBELL, MARQUIS OF, b. 1845. Son of the Duke of Argyle, and son-in-law of Queen Victoria; M.P. 1868–78; Gov.-gen. of Canada 1878–83; author in prose and verse. *Psalms*, 1877.

**Lorraine** (LOTHRINGEN, LOTHARINGIA). Region between the Scheldt, Rhine, Meuse and Saône; German duchy from 928; divided 954. The upper duchy was tributary to Germany or France till 1736, and was incorporated with France 1766. Part of it was ceded to Germany 1871.

**Lorraine,** CLAUDE. See CLAUDE LORRAINE.

**Lorraine,** HOUSE OF. Founded by Theodoric, son of Gerard, Count of Alsace, 1070. Réné II. (d. 1508) united the diverging lines, and recovered Lorraine from Charles of Burgundy. His son inherited Lorraine, which continued in the family till 1736, and was then given to Stanislaus Lescinsky in compensation for his loss of Poland.

**Lorris,** GUILLAUME DE, ab.1211–ab.1237. French poet, whose *Roman de la Rose* was completed ab. 1278 by Jean de Meung.

**Lortzing,** GUSTAV ALBERT, 1803–1851. German composer, of whose works in the lighter style three, *Zar und Zimmermann*, *Wildschütz*, and *Undine*, are still heard occasionally in Germany.

**Los Angeles.** Capital of Los Angeles co., Cal., on Los Angeles River, in a region devoted to the production of semi-tropical fruits. It has considerable manufactures, several R.C. institutions, and the Univ. of S. Cal. A Franciscan mission was founded here 1781; under Mexican control it was the State capital 1835–47. Pop., 1890, 50,395, since largely increased.

**Lossing,** BENSON JOHN, LL.D., 1813–1891. American historical writer and engraver. *Field Book of the Revolution*, 1850–52; *Hist. U. S.*, 1854–56; *Life of Gen. Schuyler*, 1860; *Civil War*, 1866–69; *War of 1812*, 1868.

**Lost Tribes.** The many correspondences of the rites and customs of primitive people with those of the early Jews has led to the identification of numerous savage and barbarous tribes with the Lost Tribes of Israel. They are confidently asserted to have been found in the ancient Etruscans, the Chinese, and even among the Indians of N. America. The resemblances upon which these theories are based are common to humanity, and the futility of such speculations is now being generally recognized.

**Lot.** River of France joining the Garonne near Aiguillon; length 300 m. The ancient Oltis.

**Lothaire,** 796–855. Emperor 840; son of Louis le Débonnaire; defeated by his brothers at Fontenay 841. By the treaty of Verdun, 843, he received Italy and the country between Germany and France (Lotharingia) with the imperial title. He was an incapable ruler.

**Lothaire II.,** "THE SAXON," d. 1137. Duke of Saxony 1106; King of Germany 1125; Emperor 1133. He humbled his rivals, the Hohenstaufens, made two campaigns in Italy, and conceded much to the Pope and to some German nobles.

**Lothringen.** See LORRAINE.

**Lothrop,** HARRIET MULFORD (STONE), b. 1844. American writer of juvenile and other tales.

**Loti,** PIERRE. See VIAUD.

**Lotions.** Fluid external applications, by wetting linen and keeping it on the parts affected.

**Lotophagi** (LOTUS-EATERS). In classical tradition, people of n. Africa, visited by Ulysses; celebrated by Homer and Tennyson.

**Lottery.** Scheme by which, in return for a small payment, a chance is secured of winning a prize; popular and demoralizing in many countries; now often prohibited by statute as against public policy. The La. Lottery Co. was chartered 1868 and suppressed 1893. The origin of the lottery may be directly traced to the ceremonial communal gambling of certain primitive peoples, and its mechanism has come down to our own times from remote antiquity. It flourishes under government protection at the present day in Spain and Italy, and in China, where it is forbidden by law. The game of POLICY (q.v.) is a modification of the Italian lottery, introduced by Italian laborers into the U. S.

**Lotti,** ANTONIO, 1667–1740. Italian composer, born in Hanover, where his father was Court Chapelmaster. He composed 17 operas for Vienna, three for Dresden, and in later life wrote sacred music.

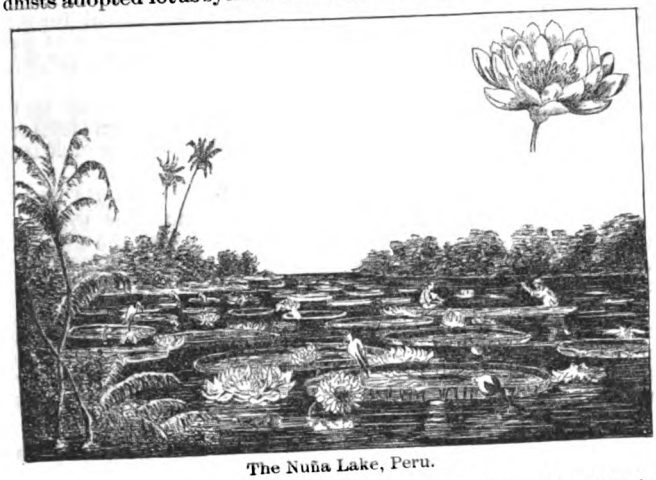
**Lottner,** HEINRICH, 1828–1866. Mining engineer of Prussia, lecturer on mining at the Berlin School of Mines. *Leitfaden zur Bergbankunde*, 1868, ed. by A. Serlo.

**Lotto.** Common amusement in Europe and America, played with numbered disks, which are drawn one at a time at random from a bag, or shaken from a bottle shaped basket. The players are furnished with cards bearing numbers, the winner being the one whose numbers are first drawn from the bag. It probably originated in Italy. A similar method of drawing the lots is practiced in Corea, where numbered balls are shaken from a bottle-shaped wooden box. Linguistic evidence there connects the game with the arrow-derived lots, originally employed in tribal divination.

**Lotto,** LORENZO, d. ab.1555. Italian painter.

**Lotus.** *Zizyphus lotus*. Spiny shrub of the natural family *Rhamnaceæ*, native of n. Africa, the fruit possessing narcotic properties; also a genus of low yellow-flowered herbs of the Pea family, natives of the Old World.—The name was also given to several species of water-lily whose most famed varieties grow in Egypt. These are *Castalia lotus* and *Castalia cœrulea*, the white and blue lotus. Another plant is also commonly but somewhat incorrectly known by this name, the *Nelumbo nelumbo*, or Rose Lotus. This water-lily is indigenous to Asia, but grew also in Egypt in antiquity. It was probably introduced there artificially, as it is now extinct. All these plants were doubtless sacred in Egypt, but only the white and blue forms appear on the monuments as ornaments and symbols. The water-lily was in Egyptian symbolism a representative of the watery element, from which all things, and especially the Heavenly Bodies, were thought to have sprung. Hence it was associated with their worship and with all gods which represent these Heavenly Bodies. Thus it became also a symbol of creation and generation and of resurrection or im-

mortality. In India and other parts of Asia the same symbolism is found, but here the Rose Lotus (so called) is the type preferred in worship. But the *Nymphæas* were also sacred in India and, aside from realistic representations of the Rose Lotus, the Egyptian types of ornament found their way thither. The Buddhists adopted lotus symbolism from the Brahmins and through



The Nuña Lake, Peru.

them it spread throughout Asia. The most frequently repeated Buddhist prayer is "O God, the jewel in the lotus"—*Om Mani padmi hom.* It has been recently claimed that all ornamental patterns of the Bronze Age and of Greek art were derived from Egyptian talismanic lotus ornament.

**Lotze,** HERMANN RUDOLF, 1817–1881. German philosopher, prof. Göttingen 1844; remarkable for his fusion of the mechanical and spiritual philosophy. *Microcosmus*, 1856–64, tr. 1886; *Logic*, 1874, tr. 1884; *Metaphysics*, 1879, tr. 1884.

**Loudon,** GIDEON ERNST, FREIHERR VON, 1716–1790. Austrian general of Scottish descent, distinguished in the Seven Years' War; Baron 1758, Field-marshal 1778. He took Belgrade 1788.

**Loudon,** JOHN CLAUDIUS, 1783–1843. Scottish botanist and landscape gardener. *Laying out Public Squares*, 1803; *Ency. of Gardening*, 1822; *Encyclopædia of Plants*, 1829–41; *Hortus Britannicus*, 1830–39; *Arboretum et Fruticetum Britannicum*, 8 vols., 1838; *Encyclopædia of Trees and Shrubs*, 1842.

**Loudoun,** JOHN CAMPBELL, EARL OF, 1705–1782. Commander of British forces in N. America 1756–57; incapable.

**Louis.** Name of 18 kings of France.

**Louis I.,** "LE DÉBONNAIRE," 778–840. Emperor 814; son of Charlemagne. He admitted his sons to participation in the empire, and thus occasioned its dissolution.

**Louis II.,** 846–879. King of France 877; son of Charles the Bald.—His son, LOUIS III., reigned 879–882.

**Louis IV.,** 921–954. Son of Charles the Simple; King 936.

**Louis V.,** 966–987. King 986; last of his line.

**Louis VI.,** "LE GROS," ab.1078–1137. King 1108; son of Philip I.; first to give Capetian royalty a recognized ascendency, and to use the oriflamme.—His son, LOUIS VII., ab.1119–1180, reigned from 1137, gained Aquitaine through his wife, and led the Second Crusade 1147.

**Louis VIII.,** 1187–1226. Son of Philip Augustus; King 1223. He warred with the English and persecuted the Albigenses.

**Louis IX.** (SAINT), 1215–1270. Son of Louis VIII.; King 1226; a sovereign of exalted character, profound piety, and large statesmanship. He maintained the royal authority, ruled wisely at home, and conducted the last two crusades, both disastrous. In the 6th, 1248–50, he was taken prisoner in Egypt with his men, released on payment of a large ransom, and remained in Palestine till 1253. In the 7th, 1270, he d. of the plague near Tunis. He was canonized 1297. Dr. Arnold called him the "noblest and holiest of monarchs."

**Louis X.,** 1289–1319. Son of Philip IV.; King 1314.

**Louis XI.,** 1423–1483. Son of Charles VII.; King 1461. He solidified the royal authority, suppressed the great feudatories, enlarged the national domain, and facilitated the administration of justice, but employed iniquitous means, and was intensely hated.

**Louis XII.,** 1462–1515. King 1498; son of Charles of Orleans. He took Milan and Naples 1500, but was driven from Italy 1513 and attacked in France.

**Louis XIII.,** 1601–1643. Son of Henry IV. and Marie de Medicis; King 1610. From the maladministration of his minority Richelieu rescued the country, and ruled it vigorously.

**Louis XIV.,** 1638–1715. King 1643; son of Louis XIII. and Anne of Austria, who with Mazarin ruled till 1661. The early part of his reign was signalized by extraordinary prosperity. His generals were successful; he annexed Flanders, Alsace, Franche Comté, Strasburg, and Luxembourg. Art and letters were fostered, internal improvements undertaken, and French influence became predominant in Europe. With the Revocation of the Edict of Nantes, 1685, and with Colbert's death,

Louis XIV.

1688, fortune changed; wars and misgovernment exhausted the finances and prostrated industry. He left a debt of three billion francs, and an impoverished country. His egotism was expressed in unscrupulous despotism, ambition, and a religion whose bigotry was said to include "neither repentance nor the love of God." He persecuted alike Protestantism, Jansenism and Quietism.

**Louis XV.,** 1710–1774. Great-grandson of Louis XIV.; King from 1715; the reign was signalized by reckless prodigality and profligacy, which paved the way for the Revolution.

**Louis XVI.,** 1754–1793. Grandson of Louis XV.; King 1774; a well-meaning but incompetent prince at an extraordinary conjuncture. He favored the American Revolutionists; convoked the estates 1789 to relieve the staggering burden of taxation, and precipitated the Revolution, which deposed, imprisoned, and guillotined him with his wife, Marie Antoinette. —His son, LOUIS XVII., 1785–1795, d. in prison. Tales of his survival were spread, and several impostors personated him.

**Louis XVIII.,** 1755–1824. Brother of Louis XVI. He fled from France 1791; was enthroned by the Allies 1814, and again 1815; pursued a reactionary policy, and did little toward the reconstruction of France.

**Louis II.,** 822–875. Roman Emperor 855; son of Lothaire. He held the Italian part of Charlemagne's empire, and fought the Saracens.

**Louis III.,** 893–911. Roman Emperor 908; son of Arnulf.

**Louis IV.,** "THE BAVARIAN," 1286–1347. Emperor 1314. Frederick of Austria disputed his claim till 1323; Pope John XXII. excommunicated him, but was deposed by him 1327.

**Louis I.** (KARL AUGUST LUDWIG), 1786–1868. King of Bavaria 1825–48; patron of art and of Lola Montez.—His grandson,

LOUIS II. (OTTO FRIEDRICH WILHELM LUDWIG), 1845–1886, King 1864, was noted for his love of music, patronage of Wagner, and eccentricities, ending in madness.

**Louis,** PIERRE CHARLES ALEXANDRE, 1787–1872. French physician, noted as an instructor and investigator. His books on phthisis, 1825, and fevers, especially typhoid, 1829, are of historical importance.

**Louisa,** 1776–1810. Queen of Prussia; daughter of the Duke of Mecklenburg-Strelitz; married, Dec. 1793, to Crown Prince

Louisa.

of Prussia, afterward Frederic William III.; mother of Emperor William; greatly beloved by the people. After Jena, 1806, she showed far more spirit than her husband, and strove to preserve his dominions from Napoleon's rapacity.

**Louisburg.** Fort on Cape Breton Island, built by the French ab.1715; taken by Mass. colonists, after 7 months' siege, June 17, 1745, on account of troubles connected with the fisheries; returned to the French 1748; attacked by the British 1758 and destroyed.

**Louis d'or.** French gold coin, minted 1641–1795; in value varying between $4 and $5; also, in Brunswick and other German States, old 5-thaler pieces. The napoleon or 20-franc piece is sometimes so called.

**Louisiade Archipelago.** Three islands of some size, and many smaller, s.e. of New Guinea; held by Great Britain. Area 850 sq. m. The natives are Papuans or Malays, and savage.

**Louisiana.** One of the Southern States; area 48,720 sq. m. The surface is level, in no part rising to 500 ft. above sea. A considerable proportion consists of low level lands along the Mississippi and Red rivers, liable to overflow, and of coast swamps, which extend to a considerable distance inland from the Gulf. Its navigable rivers are the Mississippi and Red, with a few bayous from these streams. The climate is hot, the mean annual temperature at New Orleans being ab. 70°. The rainfall is heavy, averaging probably 60 inches over the State. L. is entirely covered with recent formations. In the n.w. corner is an area of Eocene, succeeded s. by Neocene. The remainder, including all the level and coast swamp regions, is Quarternary. Its leading industry is the raising of cotton, the crop of which in 1894 was 721,591 bales. In addition, considerable sugar is raised near the coast, and some tobacco. The value of farms in 1890 was $85,381,270 and of agricultural products $54,343,953. In 1893 the mileage of railroads in the State was 2,053. The commerce of the State is carried on from New Orleans, and consists mainly of shipments of cotton. The capital is Baton Rouge, on the Mississippi. The territory was explored 1541 by De Soto, who was buried in the Mississippi; it was visited 1673 by Marquette and his Canadian followers, and 1682 by La Salle, who descended the Mississippi and took possession of the region in the name of Louis XIV., for whom he named it. He returned to France to originate a scheme for colonizing it, but on returning his ship missed the entrance to the river and was borne to Texas, where he was murdered by some of his followers. The first successful settlement was made 1700 under Iberville. In 1712 Louis XIV. granted Crozat, a Paris merchant, exclusive privilege of trade for 15 years. In 1762 the Province was ceded to Spain, but in 1800 was restored to France, and in 1803 was sold to the U. S. for $15,000,000. It then included almost the whole region w. of the Mississippi. In 1812 L. was admitted as a State with its present boundaries. The battle of New Orleans, Jan. 8, 1815, was a defeat for the British. L. seceded 1861, and was the scene of some of the most important battles of the Civil War. Pop., 1890, 1,118,587, one-half colored.

**Louisiana State University.** Military Academy 1860, at Alexandria, removed to Baton Rouge 1869. It has (1896) 22 professors and instructors, 266 students, and a library of 20,000 vols.

**Louis Napoleon.** See NAPOLEON III.

**Louis Philippe,** 1773–1850. "Citizen-King" of France; son of the Duke of Orleans. He sympathized with the Revolution, and fought at Jemmapes, but was in exile 1793–1814. Algeria was acquired during his reign, which began with the revolution of 1830 and ended with that of 1848.

**Louisville.** Capital of Jefferson co., Ky., on the Ohio, at the Falls; founded 1779–80; named from Louis XVI.; chartered 1828. It has good railroad communications and, aided by the canal around the Falls, unrestricted river commerce. Its manufactures are extensive and varied. Pop., 1890, 161,129.

**Lounsbury,** THOMAS RAYNESFORD, b. 1838. Prof. Yale 1871; biographer of J. F. Cooper 1883. *Hist. English Language*, 1879; *Studies in Chaucer*, 1892.

**Lourdes.** Town of s.w. France, on the Gave de Pau, near the Pyrenees; resort of R. C. pilgrims since 1858, when the

Pilgrims at the Grotto of Lourdes.

Virgin is said to have shown herself to a peasant girl in a grotto there, and revealed the magical virtues of a spring near-by. Pop., 1891, 6,182.

**Lourenço Marques.** Port on Delagoa Bay, e. Africa, with a town founded 1867 by Portuguese; connected by rail with the Transvaal border 1887.

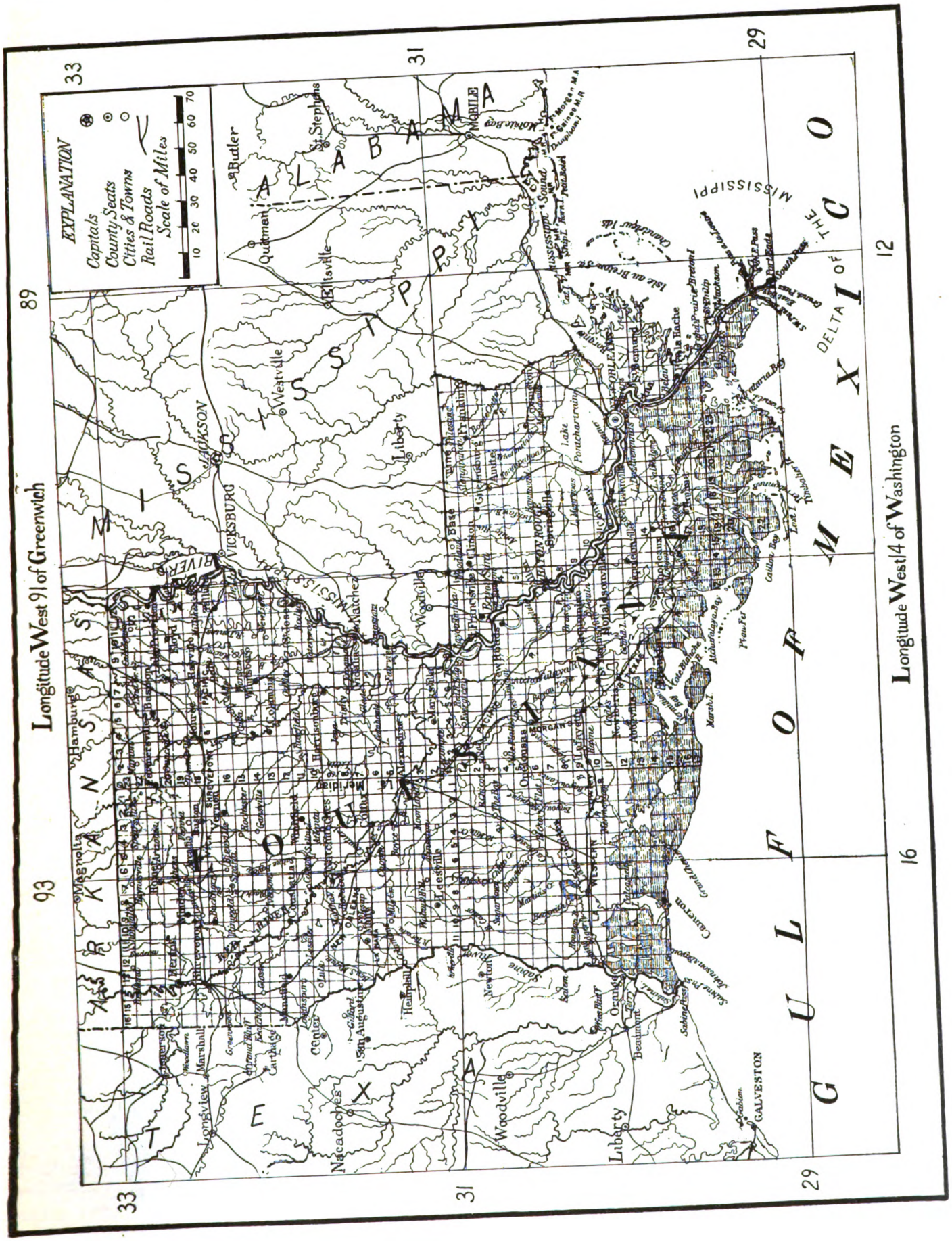
**Louse.** See ANOPLURA and PEDICULIDÆ.

**Lousewort.** Plants of the genus *Pedicularis*, natural family *Scrophulariaceæ*, of wide geographical distribution. The e. American *P. Canadensis* is known as Wood Betony.

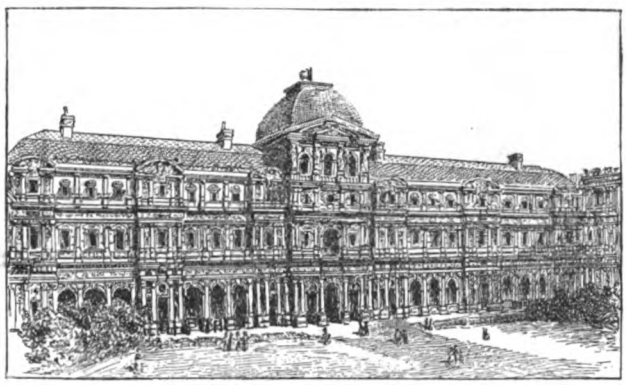
**Louvain** (LEUVEN, or LÖWEN). City of Belgium, once chief center of cloth-manufacture. Its weavers revolted 1378, and many removed. It was besieged by the French 1635, and taken by the Allies 1706. The University, founded 1426, was suppressed 1797, reorganized 1817, and has ab. 1,600 students. Pop., 1891, 40,698.

**Louvet de Couvray,** JEAN BAPTISTE, 1760–1797. French romancer, journalist, and orator of the Revolution. *Chevalier Faublas*, 1787–89; *Emilie de Varmont*, 1790; *Mes Périls*, 1795.

**Louvois,** FRANÇOIS MICHEL LETELLIER, MARQUIS DE, 1641–1691. French Sec. of War 1668. He revolutionized the army; was active in persecuting Protestants, and failed as minister of finance.


EXPLANATION
Capitals
County Seats
Cities & Towns
Rail Roads
Scale of Miles
10 20 30 40 50 60 70
Longitude West 91 of Greenwich
Longitude West 14 of Washington
ARKANSAS
TEXAS
ALABAMA
MISSISSIPPI
GULF OF MEXICO
DELTA OF THE MISSISSIPPI RIVER
Magnolia
Hamburg
Marshall
Longview
Nacadoches
Woodville
Liberty
Beaumont
GALVESTON
VICKSBURG
Natchez
Vicksburg
Jackson
Westville
Ellisville
Quitman
Butler
St. Stephens
MOBILE
NEW ORLEANS
Lake Pontchartrain
Lake Maurepas
Lake Borgne
Chandeleur Isls
Isle au Breche
Isle Dauphine
Mobile Bay
Mississippi Sound
Gulfport
Biloxi
Pascagoula
Ocean Springs
Pass Christian
Bay St. Louis
Pearl R.
Pearl River
Bogue Falaya R.
Tchefuncte R.
Amite R.
Tickfaw R.
Ponchatoula
Hammond
Kentwood
Amite
Liberty
Clinton
Jackson
Brookhaven
Natchez
Woodville
Tallulah
Vicksburg
Monroe
Shreveport
Alexandria
Opelousas
Lake Charles
Sabine Pass
Sabine R.
Calcasieu R.
Calcasieu Pass
Cameron
Grand Chenier
Gulf of Mexico
Vermilion Bay
Atchafalaya Bay
Marsh I.
Plaquemines
Pilottown
Venice
Buras
Port Eads
Southwest Pass
Pass a Loutre
Lake Pontchartrain
Lake Maurepas
Lake Borgne
Chandeleur Isls
Isle Breton
Isle au Breche
Isle Dauphine
Mobile Bay
Mobile Pass
Mobile Point
Dauphin I.
Mobile Pass

**Louvre.** Palace in Paris, now devoted to the uses of a Museum and of government offices. The building dates from the 16th century, but has had many additions, some recent. It was assigned to its present use by the French Convention, but first began to acquire great importance under Bonaparte. The picture gallery ranks among the first three or four in Europe: perhaps only the Dresden Gallery and the Pitti in Florence are



The Court of the Louvre.

distinctly superior. The collection of ancient sculpture includes the *Milo Venus*, the *Victory of Samothrace*, the *Diana of Versailles*, and *Metopes* from Olympia. The Assyrian Gallery has no rival outside the British Museum. The miscellaneous antiquities, objects of decorative art and Renaissance and modern French statuary are of rare value and great number.

**Louvre.** In Mediæval architecture an opening in the roof, protected by a covering lantern, to carry off the smoke when no chimney was used; also the openings between the slats in tower windows.

**Louvre-Boards,** or LUFFER-BOARDS. Slats introduced in unglazed openings as a partial protection from the weather.

**Lovage.** Plants of the genus *Ligusticum*, white-flowered herbs of the Carrot family, natives of the n. hemisphere.

**Lovat,** SIMON FRASER, LORD, ab.1667–1747. Erratic Scottish criminal, outlawed 1698, in exile 1702–15; executed for treason, having been on both sides in the rising of 1745.

**Love.** Feeling of strong attraction toward animate things; modification of the feeling tone which goes with any cognition. One distinguishes two great classes of feelings, pleasurable, tending to attract, and painful, to repel. When under certain conditions the emotional tone reaches a sufficiently high degree of the pleasurable, the subject may be said to experience love. Naturally the sexual life, which plays so large a rôle in our emotional existence, will determine the sentiment felt toward other persons to a marked degree, but even sexual love must be considered as but one phase of the feeling of attraction aroused by objects to which the reaction is pleasurable. The various manifestations of the emotion are impulses based upon it. See VOLITION.

**Love,** COURTS OF. Institution of the French Middle Ages. in which offenses against the laws of chilvalric love were tried, The judges were ladies usually and the decisions were binding upon all knights and to the ladies in whose employ they were.

**Love-Apple.** See TOMATO.

**Love-Birds.** Small green African parrots, sometimes, small S. American parrots. The male and female of each pair are very affectionate and inseparable companions. See AGAPORNIS ROSEICOLLIS.

**Lovedale.** Mission station in S. Africa, 650 m. n.e. of Capetown; founded 1841 by Free Ch. of Scotland; devoted to training natives.

**Love-Feast.** Among Moravians and Methodists, meal with religious exercises, in imitation of the primitive AGAPÆ (q.v.).

**Love-in-a-Mist.** *Nigella damascena.* Showy-flowered herb of the Buttercup family, native of Syria, much cultivated for ornament.

**Lovejoy,** ELIJAH PARRISH, 1802–1837. Editor at St. Louis and Alton, Ill.; killed by a mob for opposing slavery.—His brother, OWEN, 1811–1864, was active in the same cause.

**Lovelace,** RICHARD, 1618–1658. English poet, author of two exquisite songs, *To Althea* and *To Lucasta.*

**Love-lies-bleeding.** *Amaranthus caudatus.* Red-spiked herb of the Amaranth family, native of tropical regions; much planted for ornament.

**Lovell,** JOHN, 1710–1778. Head-master Boston Latin School 1738–75.—His son, JAMES, 1737–1814, was in Congress 1776–82, and naval officer at Boston from 1790.—His great-grandson, MANSFIELD, 1822–1884, was a U. S. officer 1842–54, and a Confederate Major-gen. 1861–65.

**Loven,** SVENON LOUIS, 1809–1895. Swedish zoölogist.

**Loven's Larva.** Young of certain Annelids, characterized by having a præoral and a postoral circle of cilia; from the anal region there buds out the segments that form the body of the worm.

**Lover,** SAMUEL, 1797–1868. Irish novelist, lyric poet, and dramatist, pensioned 1856. *Rory O'More*, 1836; *Handy Andy*, 1842.

**Lovering,** JOSEPH, LL.D., 1813–1892. Prof. Harvard from 1838; on U. S. Coast Survey 1867–76. *Aurora Borealis*, 1873.

**Lover's Leap.** South point of LEUCADIA (q.v.), Cape Ducato. Perpendicular cliff 2,000 ft. high, whence Sappho is said to have cast herself for love of Phaon.

**Lovewell's Fight.** Conflict with Indians in N. H., in which Capt. John Lovewell was ambushed and killed, May 8, 1725; celebrated in a ballad.

**Low Archipelago.** Group of Polynesian islands, ab. 80 in number, very flat and thinly settled. They are also known as Pearl, Dangerous and Tuamotu Islands. Rich pearl fisheries are off the coast. Under French protection since 1846.

**Low,** FREDERICK FERDINAND, b. 1828. M.C. 1861–63; Gov. of Cal. 1864–67; U. S. Minister to China 1869–74.

**Low German.** See GERMAN LANGUAGE.

**Low Latin.** Foundation of the ROMANCE LANGUAGES (q.v.).

**Low Saxon.** See GERMAN LANGUAGE.

**Low,** SETH, LL.D., b. 1850. Mayor of Brooklyn 1882–85; active reformer; pres. Columbia Coll. 1890.

**Low,** WILL HICOCK, b. 1853. N. A. 1890. American figure-painter, with much feeling for effect and balance of lines; good colorist.

**Low Countries.** See NETHERLANDS.

**Lowe,** SIR HUDSON, 1769–1844. Irish soldier, knight and Major-gen. 1814; Gov. of St. Helena 1815; disliked and satirized as Napoleon's jailer.

**Lowe,** ROBERT. See SHERBROOKE.

**Lowe,** THADDEUS S. C., b. 1832. American aeronaut and inventor of a water-gas process.

**Lowell.** City of Middlesex co., Mass., on the Merrimack, at the mouth of Concord River; incorporated 1826. Its leading industry is the manufacture of cotton goods, in which it holds high rank. Pop., 1890, 77,696.

**Lowell,** JAMES RUSSELL, LL.D., D.C.L., 1819–1891. American poet and critic; prof. Harvard 1855–76; ed. *Atlantic*

James Russell Lowell.

*Monthly* 1857–62, and *N. Am. Review* 1863–72; U. S. Minister to Spain 1877–80, and to England 1880–85. His wit and humor

appeared in *A Fable for Critics*, 1848, and in *The Biglow Papers*, 1848–66, our finest political satires. Though in serious verse his scholarship too often repressed his original fire—as in *The Cathedral*, 1870—*Sir Launfal*, 1845, touched the popular heart, and the Harvard *Commemoration Ode*, 1865, is the high-water mark of modern poetry. In prose he pub. *Fireside Travels*, 1864, *Among My Books*, 1870, *My Study Windows*, 1871, *Democracy*, etc., 1887, and *Political Essays*, 1888. *Old English Dramatists* and two other volumes appeared 1892.—His brother, ROBERT TRAILL SPENCE, 1816–1891, pub. *Fresh Hearts*, (verse), 1860; a remarkable novel, *New Priest in Conception Bay*, 1858; and *Antony Brade*, 1874.

**Lowell Institute.** Founded in Boston by bequest of John Lowell, 1799–1836, a cousin of the poet; opened 1839. It has annual courses of lectures on science, art, and religion.

**Löwenhaupt,** or **Lewenhaupt,** ADAM LOUIS, COUNT, 1659–1719. Swedish general; Gov. of Riga 1706; with Charles XII. in Russia 1708; distinguished at Pultowa 1707, and in command of the Swedish army on the king's flight; forced to capitulate 1709, and held prisoner in Russia till death.

**Lower California.** See CALIFORNIA, LOWER, and CALIFORNIA.

**Lower Empire.** See BYZANTINE EMPIRE.

**Lowndes,** WILLIAM THOMAS, d. 1843. London bookseller. *British Librarian*, 1839; *Bibliographer's Manual*, 4 vols., 1843.

**Lowrie,** JOHN CAMERON, D.D., b. 1808. American writer on missions.

**Low Sunday.** In R. C. Ch., first after Easter.

**Lowth,** ROBERT, D.D., 1710–1787. Prof. Oxford 1741; Bp. of Oxford 1766, Bp. of London 1777. *Poetry of the Hebrews*, 1753; tr. Isaiah 1778.

**Lowther,** JAMES, b. 1840. M. P. 1865; Sec. for Ireland 1878–80.

**Loxodromic Curve.** One which cuts the meridians of a sphere at a constant angle. The equation of a loxodromic of 45° is $x = \log \tan (\frac{\pi}{4} + \frac{1}{2}y)$, where x=the longitude, y=the latitude, and the origin is on the equator.

**Loxolophodont Dentition.** Molar teeth of the amœbodont-lophodont series, having the tubercular ridges on their crowns developed as follows; the anterior inner tubercle is united with the two external ones by oblique crests; the posterior inner one is absent or rudimentary, as in *Uintatherium*, an extinct mammal of the Eocene period.

**Loxosoma.** See ENDOPROCTA.

**Loyal Legion.** Military order of the U. S., instituted April 15, 1865. It admits officers of the army and navy and volunteer forces of the U. S., who served in the Civil War; also the eldest sons of such officers. It had, 1896, 8,791 members.

**Loyalty.** Faithfulness to the engagement which binds the subject of a State to its government, or any inferior to his superior.

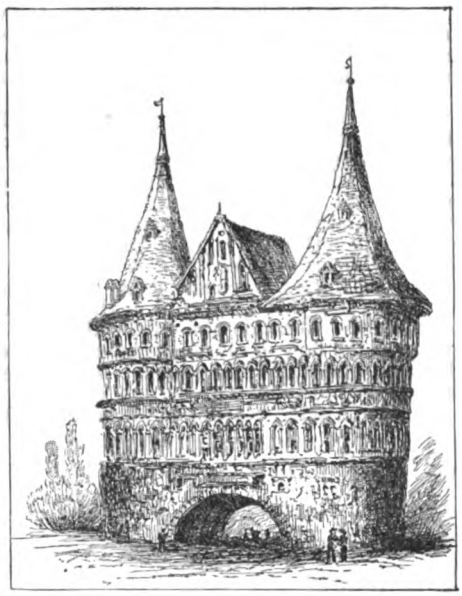
St. Ignatius Loyola.

**Loyola,** IGNATIUS, ST. (INIGO LOPEZ DE RECALDE), 1491–1556. Spanish Basque, founder of the Society of Jesus 1534; beatified 1599, canonized 1623.

**Loyson,** CHARLES. See HYACINTHE.

**Lubbock,** SIR JOHN, LL.D., D.C.L., F.R.S., b. 1834. English banker, archæologist, and entomologist; M.P. since 1870, and author of sundry measures; Vice-chancellor Univ. London 1872–80. *Prehistoric Times*, 1865; *Origin of Civilization*, 1870; *Insects*, 1874; *Addresses*, 1879; *Lectures*, 1879; *Ants, Bees, and Wasps*, 1882; *Pleasures of Life*, 1887–89.—His father, SIR JOHN WILLIAM, F.R.S., 1803–1865, was a noted astronomer.

**Lübeck.** City of Germany, on the Trave, 11 m. from the Baltic; founded 1143; free city 1226; head of the Hanseatic League; nearly ruined by the Thirty Years' War; sacked by


Holstein Gate, entrance to Lubeck.

the French Nov. 6, 1806; joined to France 1810–13; allied with Prussia 1866. Pop., 1890, 63,590.

**Lübeck,** PEACE OF. May 12, 1629, between Ferdinand II. and Christian IV. of Denmark, who withdrew from Germany.

**Lübke,** WILHELM, b. 1826. Prof. Zurich 1861–66, Stuttgart 1866–85, and Carlsruhe 1885. *History of Art*, 1861–63, tr. 1880.

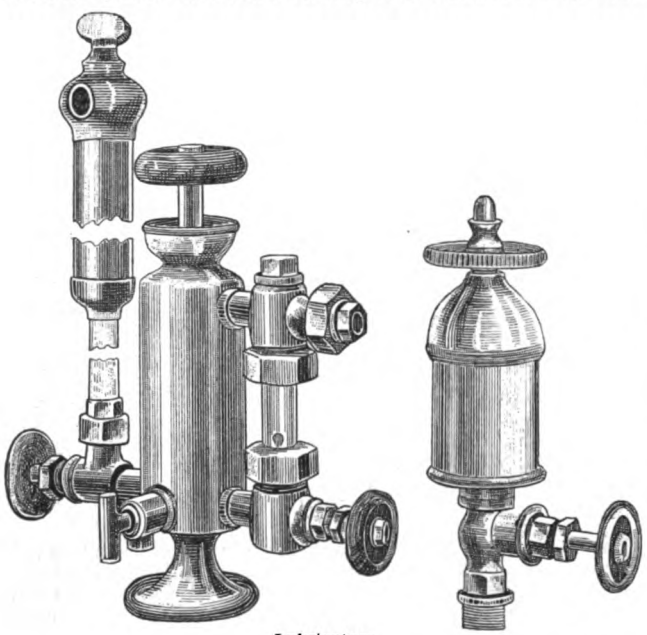
**Lublin.** Old Polish city, on the Bistritza, 96 m. s.e. of Warsaw; once commercially important; sacked by Mongols 1240, 1344, and 1477. Here Poland and Lithuania were joined 1569. Pop., 1891, 48,475.

**Lubowski,** EDWARD, b. 1839. Polish novelist and dramatist.

**Lubricants.** Materials to be introduced between two rubbing surfaces to keep them apart and diminish their friction upon each other (see FRICTION). For heavy pressures and slow velocities, the greases and other more viscous or heavy materials are used, being not so easily pressed out of the area of pressure. For light pressures and high velocities, the more limpid oils are preferred. Lubricants are of two classes, animal and mineral. Of the animal lubricants, tallow, lard and sperm oil are the usual types, with neats'-foot oil added often as adulterant. The different grades extracted by the refining and distillation of petroleum, pure or mixed, constitute the mineral lubricants. Manufactured greases are often used for bearings, the principle being that when the bearing heats by friction enough grease will be melted to run down and cool the bearing, when flow will cease. For lubricants within steam chests and cylinders, tallow or mineral oil of heavy body is used. The dangers in lubricants come from the acid used in their manufacture, and from gumming, which is an oxidation. Copper chips digested in a test tube constitute a test for acidity, as the oil turns blue or green as the acid attacks the copper: the flow of a drop of the new oil in a groove on an inclined plate of iron, at the side of which flows a similar quantity of sperm oil in a parallel groove, is a comparative test for rapidity of oxidation. Many lubricants are tested to determine their coefficient of friction under conditions as near the actual ones as possible. The machines for this purpose have usually a bearing revolved by a belt, and turning in a box which can be pressed upon the shaft with any desired pressure. The tendency of the box to turn with a measured amount of the oil introduced can be measured, and its temperature, and thus the amount of friction, determined. In other forms, two disks are pressed together, with the oil to be tested between them. Graphite in a powder is also a lubricant, and has been used not only for wooden contacts, but for lubrication of contacts in steam. It is also used mixed with oils and greases as a vehicle for it. The vegetable oils usually gum too much by oxidation to make good lubricants; they appear as adulterants.

**Lubricator.** Device for introducing lubricating materials into bearings or where they are required. There are two

types, those to get lubricants inside of steam chests and cylinders and those for bearings in the atmosphere. For cylinders, the plain cup communicates with the inside by a short tube with a valve in it. The top of the cup screws on also steam tight. When the cup is filled from the opened top, the valve is closed. When the top is in place, the valve can be opened, and the contents enter the cylinder. A condensing cylinder requires no top to the cup, as the lubricant will enter when the valve is opened on the exhausting stroke at that end of the cylinder. Improved cylinder lubricators are attached to the steam pipe by two small pipes. A column of water from condensed steam forms in the pipe from the upper inlet, and displaces the oil upward and into the steam pipe, to be carried by the steam through the valves and cylinder. Usually the drops of oil pass through a glass tube on their way from the cup, and the lubricator is known as a sight-feed lubricator. Lubricators for bearings are usually cups, from which the oil is drawn to the bearing through a tube at the bottom either by a wick-siphon, by the vibration of a wire which does not quite fit the oil-tube, or the flow of oil through the tube is controlled by a small valve adjustable from outside. For large bearings a cavity is often cast in the top of the box or cap, from which holes carry lubricant to the bearing below, and it is distributed



Lubricators.

over the latter by grooves cut in the bearing. In oil bath lubrication, which is the most efficient, the bearing is partly submerged in the lubricant, which the shaft carries with it into the pressure areas. Car-journals are lubricated on this plan, cotton waste being used to hold the oil from wastage. Pad lubrication consists of a strip of felt or similar material in the bottom of the box which holds the oil and keeps the bearing unctuous. For lubrication of crank-pins, siphon or spatter cups may be used, or the lubricant may be supplied at or near the center of motion and be forced to the bearing by centrifugal force. Modern practice supplies oil from a cup to a flat piece of wick or other woven web, whose under side a flat strip of metal in an open cup scrapes each time as the crank passes its upper center. The oil collected on the web flows into the cup and into the bearing.

**Lucan,** George Charles Bingham, Earl of, 1800–1888. Commander of cavalry in the Crimean war; Lieut.-gen. 1858, Field-marshal 1887.

**Lucania.** Region of ancient Italy, on the Gulf of Tarentum.

**Lucanus** (Lucan), Marcus Annæus, 39–65. Latin poet, nephew of Seneca; conspirator and informer. His *Pharsalia*, an epic in ten books, handles the war of Cæsar and Pompey.

**Lucar,** Cyril. See Cyril Lucar.

**Lucarne.** In Gothic Architecture, a garret window; also a small opening in a spire.

**Lucas,** Paul, 1664–1737. French traveler in the East, author of several narratives. *Voyage au Levant*, 1704–14.

**Lucas van Leyden.** See Leyden.

**Lucca.** Ancient city of w. Italy, 14 m. n.e. of Pisa; long capital of a province, duchy, republic, or principality; ceded to Tuscany 1847; annexed to Sardinia 1860. It exports olive oil and silk. Pop. (commune) 76,500.

**Lucca** (Lucas). Pauline, b. 1842. Austrian singer, prominent in opera 1859–85.

**Lucernaridæ** (Calycozoa, Podactinaria). Cup-shaped Acalephs that attach themselves to objects by their aboral pole. They have four wide gastric pouches and eight lobes or arms, on the edge of the umbrella, beset with short tentacles.

**Lucernarida,** or Scyphomedusæ. Group of *Hydrozoa*, including Lucernaridæ, Pelagidæ, and Rhizostomidæ (q.v.).

**Lucerne.** See Alfalfa.

**Lucerne.** Swiss city, capital of a canton, on a narrow lake 23 m. long, and famous for its beauty. It is at an altitude

Lucerne.

of 1,490 ft. and is a favorite tourists' resort. It has four bridges, two of which are adorned with ancient paintings. Pop. 20,310.

**Lucian,** ab.125–ab.210. Syrian-Greek orator, sophist, and author; Epicurean, cosmopolitan and satirist. His dialogues, partly tr. 1781, are full of wit and skepticism; no ancient author is more entertaining or more "modern." He parodied the novels of his time; *Lucius, or the Ass*, is doubtfully ascribed to him.

**Lucian,** St., ab.250–312. Syrian heretic, who conformed and was martyred at Nicomedia.

**Lucifer.** Morning Star; name applied, Isa. xiv. 12, to the King of Babylon; and popularly transferred to the apostate Satan.

**Lucifer,** d. 371. Bp. of Cagliari in Sardinia; vehement opponent of Arianism, pugnacious and intractable dogmatist, banished 354 and long in Syria; founder of a short-lived sect.

**Lucilius,** Caius, ab.180–103 B.C. Latin satirical poet, regarded as the founder of classical satire. Fragments only remain.

**Lucimeter.** Form of sunshine-recorder; apparatus for measuring the effect of sunshine, due to the combined effect of its intensity and duration in promoting evaporation. It consists of a blackened glass bulb containing water, a tube connecting it with a clear glass bulb. When the whole is exposed to the sun, the black bulb is hotter, its water evaporates, and the vapor condenses in the cooler clear bulb, where its amount is measured daily.

**Lucina.** Roman goddess who presided over childbirth; surname of Juno and Diana.

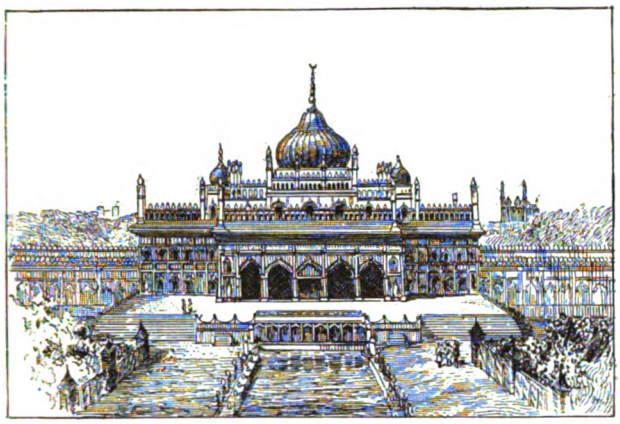
**Lucius I.** Bp. of Rome 253–54.—II. Gherardo Caccianemici, Pope 1144–45.—III. Ubaldo Allueingoli, Pope 1181–85.

**Lücke,** Gottfried Christian Friedrich, 1791–1855. Prof. Bonn 1818–29, and Göttingen 1829; commentator on St. John, 1820–25. *N. T. Hermeneutics*, 1817.

**Luck Money.** Attribution of magical or talismanic properties to coins is very widespread, certain pieces being especially valued as charms. In Italy, at the present day, the old Roman coins dug up by the peasants in the fields are treasured as amulets under the name of Witch Money. Old or unusual coins are more particularly supposed to bring luck.

**Luckner,** Nicolaus, Freiherr von, 1722–1794. Bavarian soldier in the service of Prussia, and from 1763 of France; Marshal 1791; guillotined.

**Lucknow.** Capital of Oudh, India; on the Gumti, a branch of the Ganges. Here the mutiny of native troops broke out, May 1857. Havelock cut his way through the lines of the



House of the Twelve Patriarchs, Lucknow.

besiegers Sept. 26; Sir Colin Campbell came to their relief Nov. 17; was evacuated Nov. 22, and regained after a severe struggle March 19, 1858. Pop., 1891, 273,090.

**Lucretia.** Roman matron, whose suicide on being outraged by Tarquin led to establishment of the republic.

**Lucretius,** TITUS CAIUS, 99–55 B.C. Roman poet, whose *De Rerum Natura*, in six books, presents the arguments for the Epicurean philosophy, in hexameter verse, and abounds in fine imagery and brilliant description. Though never popular, some regard him as the greatest of Latin poets. The tale of his madness and suicide, celebrated by Tennyson, is doubtful.

**Lucullus,** LUCIUS LICINIUS, ab.110–ab.57 B.C. Consul 74. He successfully prosecuted war against Mithridates till 66; returned to Rome with immense wealth, and lived in great luxury and magnificence.

**Lucy,** ST. Virgin martyr at Syracuse ab.313; patron of the blind. Her day is Dec. 13.

**Luddites.** English rioters who warred on machinery 1811–17, supposing it injurious to the interests of operatives.

**Luden,** HEINRICH, 1780–1847. Prof. Jena from 1806. Historian of the Middle Ages, 1821–22, and of the German people, 1825–37.

**Lüders,** ALEXANDER, 1790–1874. Russian general.

**Lüders,** CHARLES HENRY, 1858–1891. American poet.

**Ludhiana.** Capital of a district in the Punjab, India; near the Sutlej; founded 1480; of some commercial importance. Pop. ab. 45,000.

**Ludlow.** Uppermost English Silurian beds, corresponding to the American Lower Helderberg. In these strata occur the oldest vertebrate fossils known in the Old World, except a single specimen reported by Lindström from the Wenlock or Niagara rocks of the island of Gothland. See SILURIAN.

**Ludlow,** EDMUND, 1620–1693. English republican, M.P. 1645; one of Charles I.'s judges; in exile from 1660. *Memoirs*, 1698–99.

**Ludlow,** FITZHUGH, 1836–1870. American author and journalist. *Hasheesh Eater*, 1857; *Opium Habit*, 1868.

**Ludlow,** JAMES MEEKER, D.D., b. 1841. Presb. pastor in Brooklyn, 1877–86, and E. Orange, N. J. *Captain of the Janizaries*, 1886.

**Ludolphus,** JOB, 1624–1704. German author of an Ethiopic lexicon and grammar; pioneer in the study of that language. *Hist. Æthiopica*, 1681.

**Ludovisi Villa.** At Rome. It contains a fine collection of antiques, including the head of Juno and the Mars, hence named.

**Ludwig.** See LOUIS I.

**Ludwig,** CHRISTIAN GOTTLIEB, 1709–1773. Prof. Leipzig 1747. *De vegetatione plantarum marinarum*, 1736; *Definitiones generum plantarum*, 1737–60; *Institutiones historiæ-physicæ regni vegetabilis*, 1742–57.

**Ludwig,** KARL, b. 1816. Prof. Vienna 1855, and Leipzig from 1865; writer on physiology.

**Ludwig,** OTTO, 1813–1865. German dramatist and novelist. *Between Heaven and Earth*, 1856; *Shakespeare Studies*, 1871.

**Ludwig's Canal.** In Bavaria, connecting the basins of the Rhine and Danube, beginning at Bamberg, following the Regnitz to Furth, and ending at Kelheim at the mouth of the Altmuhl. Length 107 m.; depth 5 ft.; width at surface 57 ft., at bottom 36 ft.

**Ludwigshafen.** Town in Germany on the Rhine, opposite Mannheim, with important manufactures of wool and chemical products. Pop., 1890, 28,800.

**Luffer.** See LOUVRE.

**Luffing.** Bringing a ship nearer the wind.

**Lugano.** Health resort with Italian climate in Switzerland, at an altitude of 902 ft., on the n. side of Lake Lugano. Lugano Fair, dating from 1513, is the largest live stock fair in Switzerland. Mazzini had his headquarters here during the Italian struggle for independence, 1848–66.

**Lugano,** LAKE OF. In Switzerland and n. Italy, between the lakes Maggiore and Como. It is inclosed by lofty, abrupt and wooded mountains. Area 19 sq. m.

**Luini,** BERNARDINO, ab.1470–ab.1535. Italian painter, leading scholar of Da Vinci, to whom many of his pictures have

Tobias and the Angel. Ambrosiana Gallery, Milan.

been attributed; as *Modesty and Vanity*, in the Sciarra Palace at Rome, and *Christ and the Doctors*, in the National Gallery, London. He has fine frescoes at Lugano.

**Lukaszewicz,** JOSEF, 1799–1873. Historian of Protestants and schools in Poland.

**Luke,** ST. Author of the 3d Gospel and the Acts of the Apostles; a physician and companion of St. Paul; perhaps one of the 70 disciples, but not an apostle; more a man of letters than the other evangelists. His books were written after 70.

**Lully,** or **Lulli,** JEAN BAPTISTE DE, 1633–1687. Composer, Florentine by birth; founder of the French National opera; leader of Louis XIV.'s *grande bande* of 24 violins and 16 *petits violons*. He began his French career in the kitchen of Mdlle. de Montpensier. His significance in musical history is as the founder of the French school of opera and the first who made the rhythm and accent of the language to dominate his music. Operas: *Les Fêtes de l'Amour et de Bacchus*, 1672; *Cadmus et Hermione*, 1673; *Alceste*, 1674; *Thésée*, 1675; *Atys*, 1676; *Isis*, 1677; *Psyche*, 1678; *Bellérophon*, 1679; *Proserpine*, 1680; *Persée*, 1682; *Phaëton*, 1683; *Amadis de Gaule*, 1684; *Roland*, 1685; *Armide et Renaud*, 1686; *Acis et Galatée*, 1686.

**Lully,** RAYMUND, ab.1235–1315. Majorcan missionary, twice expelled from Africa; mortally wounded at Bugia in Algeria by Moslems. He promoted oriental studies, and wrote the puzzling *Ars Magna*, 12 books against Averroes, and on alchemy.

**Lumbago.** Pain and soreness in the loins caused by rheumatism, strain, exposure to cold, or may be simply neuralgia. Not a symptom of disease of the kidneys.

**Lumber.** See FORESTRY.

**Lumbricus Terrestris.** Earthworm or Angleworm; terricolous, oligochætous Annelid. They burrow deeply into the earth, keeping below the frost line and drought line. They depend on the presence of moisture for those vital functions of the skin, chief of which is respiration. The body is only slightly differentiated into regions; a glandular clitellus or girdle lies at ab. 30 segments behind the mouth. This gland secretes a cocoon and fills it with milk: in it the eggs develop as it lies in some manure heap or place where vegetable fiber is decomposing. The worm secures nourishment by eating earth mixed with organic material, and the casts are thrown up on the surface, helping to form vegetable mould. The locomotion is by means of four pairs of setæ on each segment. No eyes are present, yet they are sensitive to light. They feed on the surface at night; in the fall, mutual copulation takes place, for they are hermaphrodite, the genitalia lying in the 9th to the 14th segments. The mouth is in the second segment, the first segment forming a præstomium. The third contains the brain, which is united to a ventral row of similar ganglia, any one of which may become a brain when the worm is cut in two.

**Lumen.** In Plant Anatomy, cavity of a cell.

**Luminais,** EVARISTE VITAL, b. 1822. French painter, chiefly historical.

**Luminosity.** Function of emitting light, possessed by many Fungi and animals. It is dependent upon the life of the organisms, and probably due to chemical action within their tissues, the result of destructive metabolism.

**Luminous Paint.** Phosphorescent powder ground up with some colorless medium and used as a paint. See CALCIUM SULPHIDE.

**Lummis,** CHARLES F., b. 1859. American traveler and author. *A New Mexico David*, 1891; *A Tramp Across the Continent*, 1893; *Gold Fish of Gran Chimu*, 1896.

**Lumniczer,** ALEXANDER, 1821–1892. Prof. Budapest 1872; writer on surgery.

**Lumpkin,** WILSON, 1783–1870. M. C. 1815–17 and 1827–31; Gov. of Ga. 1831–34; U.S. Senator 1837–41.—His brother, JOSEPH HENRY, LL.D., 1799–1867, was a justice of Ga. Supreme Court from 1845, and long chief-justice.

**Luna.** Moon-goddess, anciently worshiped at Rome.

**Luna,** ALVARO DE, ab.1390–1453. Spanish courtier, soldier, and poet; Constable of Castile 1423; Duke of Truxillo; executed.

**Lunacy,** or INSANITY. The derangement of mental function resulting from disease or disorder of the brain. One or more of the mental elements may be affected and the impairment may be temporary or permanent. No sharp line can be drawn between sanity and insanity. In the sane mind there is a proportion existing between thought, feeling and action and external stimuli which we recognize as reasonable and normal, and when from disordered physical conditions this relation becomes markedly unusual, we say that the subject is abnormal and insane. The forms of insanity have been variously classified, and there is no agreement among alienists on that point. Perhaps at the present time the most commonly accepted division of the main forms of insanity occurring in the developed brain is the following (Von Krafft-Ebing):

A.—MENTAL DISEASES WITHOUT ORGANIC LESIONS. I. Psychoneuroses, occurring in a previously healthy brain: (1) Melancholia, a spontaneous, painful emotional state with depression of all the mental and physical faculties; (2) Mania, a spontaneous, exalted, emotional state with increased activity of all the mental and nervous functions; (3) Dementia, a perverted intellectual state in which the normal processes of thought, reason and volition are interfered with or suspended. II. Psychical Degenerations, occurring in a predisposed, weak brain: (1) Periodical Insanity, recurring psychoneuroses; (2) Partial Degenerative Insanity, mental degeneration to a varying degree; it includes, (*a*) Emotional Insanity, which is chiefly hysterical in character, (*b*) Moral Insanity, marked by a lack of moral control, and (*c*) Impulsive Insanity, marked by a lack of voluntary control over morbid impulses; (3) Paranoia, a chronic mental derangement characterized by primary fixed systematized delusions, which dominate but do not impair the intellectual processes.

B.—MENTAL DISEASES WITH ORGANIC LESIONS. (1) Alcoholic Insanity, (2) Senile Dementia, (3) Syphilitic Dementia, (4) Paretic Dementia, General Paresis, or Softening of the Brain, a chronic diffuse inflammation of the brain, with mental, motor, vasomotor, and sensory symptoms, with progressive course and fatal termination.

The most powerful predisposing causes of insanity are a bad nervous heredity and the increasing nervous pressure of modern civilized life. The exciting causes are very numerous; *e.g.*, emotional shock, exhausting diseases of any kind, sexual and other excesses, childbirth, sunstroke, etc. Over sixty per cent of those suffering from the psychoneuroses recover. The prognosis in the physical degenerations is not so favorable and they tend to recur. The organic insanities (B.) rarely recover. In 1889 the number of insane in England was 84,345, and in Scotland, 11,954; in U. S. there were treated in institutions 97,535. See IDIOCY.

**Lunalilo,** 1835–1874. King of the Sandwich Islands 1873.

**Lunar Caustic.** See SILVER NITRATE.

**Lunar Distance.** Distance of the moon from the sun or a star, employed sometimes for determining longitude at sea.

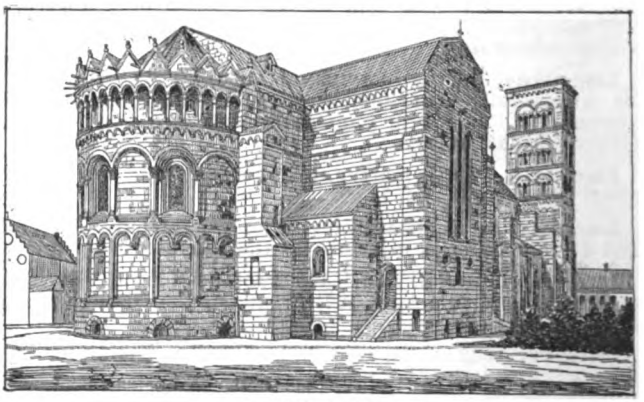
**Lunar Radiation.** Any radiation from the moon, but especially applied in meteorology to the heat effect. Observations by C. C. Hutchins, 1889, show that the heat received by the earth by lunar radiation amounts to 0.00002 calorics per square centimeter per minute.

**Lunar Theory.** Deduction of the moon's motion by the law of gravitation. See MOON.

**Lunation.** Period of the moon's synodic revolution about the earth, or interval from one new moon to the next. It varies somewhat, but the mean interval is 29.5305879 days.

**Luna y Arellano,** TRISTAN DE, 1519–1571. Spanish explorer of Florida 1559–62; Gov. of Yucatan 1563.

**Lund.** City of s. Sweden, nearly opposite Copenhagen; important ab.1050–1500, and long the Danish capital; its uni-



Lund Cathedral.

versity, founded 1668, has ab. 800 students and a library of 150,000 vols. It has a cathedral built in 1145. Pop., 1891, 15,023.

**Lund,** JOHN REINHOLD, b. 1859. German-American musician.

**Lund,** TROELS, b. 1840. Danish historian.

**Lundgren,** EGRON SELLIF, 1815–1875. Swedish painter, active mostly in England.

**Lundy,** BENJAMIN, 1789–1839. Editor and publisher of anti-slavery periodicals.

**Lundy,** JOHN PATTERSON, D.D., 1823–1892. Rector in New York 1869–75. *Art and Symbolism of Primitive Ch.*, 1876.

**Lundy's Lane,** BATTLE OF. Near Niagara Falls, July 24, 1814; victory for the Americans under Col. Winfield Scott.

**Lune.** Portion of a closed surface of revolution bounded by two planes intersecting in the axis of the curve generating the surface. Without a qualifying word, the Spherical Lune is intended.

**Lüneburg.** Province of HANOVER (q.v.), s. of the Elbe; principality connected with Brunswick from 1235. Its sovereigns were ancestors of those of England from 1714.

**Lunette.** See FIELD WORKS.

**Lunéville,** PEACE OF. Feb. 9, 1801, between France and Austria; the Rhine to make the boundary of France; the independence of Batavian, Helvetian, Cisalpine, and Ligurian Republics guaranteed.

**Lung-Book.** Lamellated respiratory organ of Arachnids, a sort of intermediate organ between the gills of *Crustacea* and the tracheæ of insects.

**Lung Fever.** 1. PNEUMONIA. 2. PLEURO-PNEUMONIA OF CATTLE (q.v.).

**Lungs.** See RESPIRATION, ORGANS OF.

**Lungwort.** *Pneumaria maritima.* Smooth, fleshy herb of northern maritime regions, of the Borage family; also species of *Merteusia* of the same family; also *Sticta pulmonaria*, a large lichen, supposed to be a cure for consumption.

Sticta pulmonaria.

**Lunula.** Hollow heart-shaped place in the anterior dorsal edges of Lamellibranch shells, in front of the apex or umbo; best seen in the clam with its valves closed.

**Lupercalia.** Ancient Roman festival of Lupercus, god of fertility; falling in February; said to date from the foundation of Rome. Half naked youths clad in goat skins offered sacrifices in the Lupercal, where Romulus and Remus were suckled by the wolf. They then ran through the city, striking with thongs all whom they met, especially women, who were believed to be thus made more fertile.

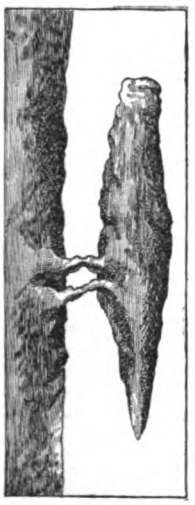
**Lupine.** Plants of the genus *Lupinus* of the Pea family, of wide geographical distribution, sometimes cultivated for their showy flowers.

**Lupuline.** Bitter, aromatic, yellow, waxy resin, occurring on the bracts of the hop fruit, used in pharmacy. It contains essential oils and at least one alkaloid.

**Lupus,** SERVATUS, ab.805–ab.865. Abbot of Ferrières 842; defender of GOTTSHALK (q.v.) and his predestinarian tenets.

**Lupus.** Two distinct diseases of the skin, usually found in women. The disease begins as a red and slightly elevated spot, which continues to grow larger, much like a ringworm. The mild form yields readily to treatment, while the severer form is simply tuberculosis of the skin and often requires the use of the knife.

**Luray.** Capital of Page co., Va., in the Shenandoah Valley; noted for its extensive cavern, opened 1878. Pop., 1890, 2,809.



Curious Stalactite growth—from Luray Cavern.

**Lurcher.** Cross between greyhound and collie or other dog.

**Lusatia.** Part of Germany, n. of Bohemia; once two margraviates; assigned to Bohemia 1319, to M. Corvinus 1478, and to Saxony 1635; now held mostly by Prussia.

**Lushington,** STEPHEN, D.C.L., 1782–1868. M. P. 1807; prominent advocate; Judge of Admiralty 1838–67.

**Lusiad.** See CAMOENS.

**Lusignan,** GUY DE. King of Jerusalem 1186 by right of his wife Sibylla, sister of Baldwin IV.; taken prisoner at the disastrous battle of Tiberias, July 4, 1187.

**Lusitania.** Land of the Lusitani; between the Durius and Tagus rivers; conquered by Romans 137 B.C.; overrun in 5th century by Alans and Visigoths, who were conquered by Arabs 713, and these by Alphonso VI. of Castile in 1095. It coincided in part with Portugal.

**Lusk,** WILLIAM THOMPSON, M.D., b. 1838. Prof. of Obstetrics at Bellevue 1871. *Midwifery*, 1882.

**Lustig,** AUGUST, 1840–1895. Alsatian poet; author of many dialect songs, and composer of tunes for them.

**Lustration.** With Greeks and Romans, religious rite aiming at moral or ceremonial purification.

**Lustrum.** Expiatory sacrifice offered by the censors once in five years on behalf of the whole Roman people; thence period of five years.

**Lute.** Musical instrument of the stringed family, whose strings are sounded by being plucked by the fingers of the right hand, while those of the left form the tones by stopping the strings on a finger-board, as in the case of its degenerate relatives the guitar, mandolin, banjo, etc. It was known to the ancient Egyptians, and became the favorite instrument of the Arabs, who carried it into Spain and lower Italy, whence it spread over Europe by the 14th century. From the 15th to the 17th century its significance as a household instrument might be compared with that of the pianoforte to-day. The Arabian lute had eight strings and is still used in the East. The European lute finally had 24 strings.

Lute.

**Lutetia,** or LUTETIA PARISIORUM. Roman name of Paris.

**Luthardt,** CHRISTOPH ERNST, D.D., b. 1823. Prof. Leipzig 1856. *Dogmatics*, 1865; *St. John's Gospel*, 1878; *Ethics*, 1887–90.

**Luther,** MARTIN, 1483–1546. Initiator of the Protestant Reformation, and its leader in Germany; son of a miner at Eisleben and Mansfeld; sent to school at Magdeburg and Eisenach; patronized by Frau Cotta; educated at Erfurt 1501–5; Augustinian monk there 1505–8; priest 1507; prof. at Wittenberg 1508. He spent some weeks in Rome 1511; attacked indulgences, as preached and sold by Tetzel, and nailed his famous 95 theses to the ch. door Oct. 31, 1517; was cited to Rome, but protected by the Elector of Saxony; disputed with Cajetan and Eck 1519; was excommunicated by a papal bull, which he publicly burned Dec. 10, 1520; went to the Diet of Worms, April 1521, under an imperial safe conduct, and maintained his position in words that roused the German conscience and are still moving; was seized on his way back by friends who aimed at his safety, and kept till March 1522 in Wartburg Castle, where he tr. the N. T. and wrote much. Returning to Wittenberg, he repressed disorders, resumed his lectures, tr. O. T., pub. *Formula Missæ* and 24 hymns, answered Henry VIII. and Erasmus, and in 1525 married Catherine von Bora, a former nun. The rest of his life was spent in teaching and writing, largely controversial. In 1529 he pub. his two Catechisms and held a fruitless conference with Zwingli at Marburg. The Diet at Augsburg, 1530, where he was represented by Melanchthon, was the last momentous incident of his career. L. was the chief force of his era. His simple humanness, fearless courage, and mighty will attracted general respect and sympathy, and in the main carried his countrymen with him. His theology was positive and unbending enough to meet the requirements of a dogmatic age; his revolt from Rome was gradual but complete, and met the aspirations toward freedom of the time. His

Martin Luther—Woodcut by Lucas Cranach.

German Bible did much to fix the language, and remains a classic. His hymns, especially *Ein feste Burg*, were battle-songs, and helped his cause mightily. He loved music, and exerted a powerful influence on it, as with it in his chorales. His works have appeared in many editions and translations.

**Lutheran Church.** Aggregate of those Protestants who accepted the Augsburg Confession and broke with the Swiss Reformation. It includes now most German Protestants, except as fused with the Reformed, and almost all the people of Denmark, Norway, Sweden, Finland, Iceland, and the Baltic provinces of Russia, some 50,000,000, besides at least 1,300,000 communicants in the U. S.

**Lutidines.** $O_5H_3N(CH_3)_2$. Dimethyl pyridines; liquid bases, boiling at 150°–170° C.; present in bone-oil and coal tar.

**Lütke,** FEDOR PETROVITCH, 1797–1882. Russian seaman, who circumnavigated the globe with Golownin 1817–19; made 4 expeditions to Nova Zembla 1821–24; explored Bering's Strait and the sea of Kamtchatka 1826–29; founder of the Russian Geographical Society.

**Lutterworth.** Village of Leicestershire, 8 m. n. of Rugby; noted as the cure and last residence of Wiclif, 1374–84. Here his bones were disinterred 1428 by heresy-hunters and cast into the Swift.

**Lutti,** FRANCESCA, 1831–1878. Tyrolese poet. *Alberta*, 1851.

**Luttich.** See LIÉGE.

**Lützen.** Town of Prussian Saxony, scene of two important battles. Here Gustavus Adolphus of Sweden defeated the imperialists under Wallenstein Nov. 16, 1632, but was slain. A little s., Napoleon defeated the combined armies of Russia and Prussia May 2, 1813, but lost more than 12,000 men. Pop., 1890, 3,564.

**Luxembourg,** FRANÇOIS HENRI DE MONTMORENCY-BOUTEVILLE, DUC DE, 1628–1695. General of Louis XIV.; brought up with Condé, and his associate in battles of the Fronde; Marshal 1675; distinguished in the Netherlands.

**Luxembourg,** LINE OF. Founded by John, son of Emperor Henry VII., who obtained for him the crown of Bohemia after the Premsyl dynasty expired, 1306. It lasted till 1437.

**Luxemburg.** German duchy, held by the Counts of Limbourg, then by Burgundy and Austria; ceded to France 1797; in 1814 given to the King of Holland. Part of it remains independent, with an area of 998 sq. m., and a pop. of ab. 212,000; part is a province of Belgium.

**Luxor.** Modern Egyptian town in Upper Egypt, 2 m. s. of Karnak. Site of important Theban ruins, dating from kings of

Columns of Amenhotep III. at Luxor.

the XVIIIth and XIXth dynasties, especially Amenophis III. and Rameses II., 1500–1200 B.C.

**Luynes,** CHARLES D'ALBERT, DUC DE, 1578–1621. Favorite of Louis XIII.; peer of France 1617, constable and chancellor.

**Luys,** JULES BERNARD, b. 1828. French alienist; ed. *L'Encéphale* 1881–88. *The Brain and Its Functions*, 1878; *Mental Maladies*, 1881.

**Luzerne,** ANNE CÉSAR DE, LL.D., 1741–1791. French envoy to the U. S. 1779–83, where his character and services were highly esteemed.—His brother, CÉSAR GUILLAUME, 1738–1821, Bp. of Langres 1770, cardinal 1817, was a noted theologian.

**Luzon.** Largest of the PHILIPPINE ISLANDS (q.v.). Area, 39,650 sq. m. Pop. ab. 3,500,000.

**Luzzato,** SAMUEL DAVID, 1801–1865. Austrian Jew, prof. Padua from 1829; author of grammars and commentaries.

**Lwoff,** ALEXIS VON, 1799–1870. Russian musician, violinist, composer of several operas and the music of the Russian National hymn, *God Save our Royal Czar*, for which Shukowski wrote the words.

**Lyall,** EDNA. See BAYLY, ADA E.

**Lybians.** See BERBERS.

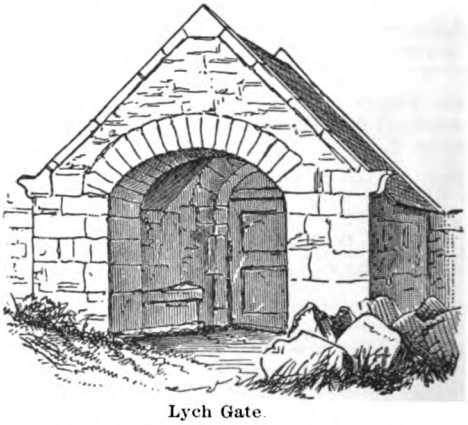
**Lycanthropy.** Superstitious belief common in the past that witches may be transformed into wolves, or a human body be possessed by a wolfish nature. Executions of supposed lycanthropes were common in France till ab.1650.

**Lycaon.** King of Arcadia, slain by Zeus with 49 of his 50 sons for sacrilege.

**Lycaonia.** District in s.e. Phrygia, whose people spoke a dialect of supposed unknown affinities.

**Lyceum.** Gymnasium of Athens, close by the temple of Apollo Lyceus. Aristotle taught here, as he walked in its groves of plane trees.

**Lych Gate,** or LICH GATE. Churchyard gate covered with a roof or connected with a porch or chapel where the body is



Lych Gate.

placed during the first part of a burial service. Common in some parts of England and Wales, but rare in Scotland and on the Continent.

**Lycia.** District in s.w. Asia Minor, prominent in the Iliad; early colonized by Greeks. It took part in revolt against Persia, but aided Xerxes in his invasion of Greece. It contains vast ruins, inscriptions on some of which belong to the Zendic group of languages.

**Lycon.** Head of the Peripatetic school at Athens 270–226 B.C.

**Lycoperdaceæ.** Family of *Fungi* of the order *Gasteromycetes*, including the larger Puff-balls.

**Lycophron,** 3d cent. B.C. Alexandrian Greek poet, dramatist, and grammarian. His *Cassandra* alone remains.

**Lycopodiaceæ.** Class of plants of the sub-kingdom *Pteridophyta*, comprising the Clubmosses, mostly bearing their sporanges in club-shaped spikes; extensively used for decorative purposes at holiday time. The spores of *Lycopodium clavatum* form the pyrotechnic Lycopodium powder, collected mainly in central Europe.

**Lycopodium.** Principal genus of the class *Lycopodiaceæ*, including ab. 100 species. Some of them are commonly known as Clubmosses.

**Lycopolis.** Very ancient city of Egypt, sacred to Anubis; residence of monarchs of the Middle Kingdom, ab. 2000 B.C. Its remains are scanty.

**Lycotropous.** In Botany, curved orthotropous ovule.

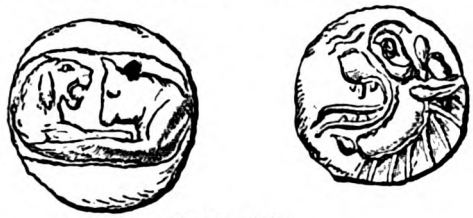
**Lycurgus,** 9th cent. B.C. Spartan legislator; said to have traveled in the East, and on his return to have reformed the state. He made a new division of property, remodeled the constitution, obtained from the oracle at Delphi an approval

of his institutions, and from the people a promise to make no changes in them before his return, and then went into voluntary exile. He was honored with a temple and yearly sacrifices.

**Lycurgus,** d. ab. 323 B.C. Attic orator and statesman.

**Lydgate,** JOHN, ab.1370–ab.1440. English poet. *Storie of Thebes; Troye Book; Falls of Princes.*

**Lydia.** District in w. Asia Minor; known to Homer as Mæonia; early seat of Asiatic civilization. Its monarchy



Lydian Coins.

lasted 716–546 B.C., and came to include all the region w. of the Halys. It was bequeathed to the Romans by Attalus III. 133 B.C.

**Lydian Stone.** Touchstone; nearly black, fine grained, siliceous mineral, allied to jasper; used for testing the relative fineness of alloys of gold and silver, by a comparison of the colors left upon the stone when rubbed with the metals.

**Lye.** Generally solutions of salts, more particularly those of potassium and sodium. Caustic lyes are solutions of potassium or sodium hydroxides; mild lyes, those of their carbonates.

**Lyell,** SIR CHARLES, 1797–1875. Prof. of Geology in King's Coll., London, 1832; knighted 1848; Baronet 1864. He grasped in early life the principle, enunciated by Hutton and lost sight of in the quarrels of the Vulcanists and Neptunists, that the former changes of the Earth's surface are to be explained by reference to causes now in operation. To the establishment of this truth he devoted his life, traveling extensively to make investigations. In *Principles of Geology*, 1830–33, he sketched in broad outline and illustrated with a wealth of facts nearly all those fundamental truths now accepted as the basis of Geology. Many of these are further developed in *The Antiquity of Man*, 1863, and other books. His views, which were the foundation of the Uniformitarian school, were opposed to the then prevalent CATASTROPHIST (q.v.) doctrines.

**Lyencephala.** Group of Mammals, including the Monotremes and Marsupials. In these the corpus callosum is not developed: the cerebral hemispheres are smooth and leave a part of the optic lobes exposed.

**Lyly,** JOHN, 1554–1606. English dramatist and novelist, father of Euphuism.

**Lyman,** CHESTER SMITH, 1814–1890. Prof. of Physics at Yale 1859–84, and of Astronomy 1871–89; author of many investigations and some inventions.

**Lyman,** HENRY MUNSON, M.D., b. 1835. Prof. Rush Medical Coll., Chicago, since 1870. *Anæsthesia*, 1881; *Insomnia*, 1885.—His father, DAVID BELDEN, 1803–1884, was a missionary in the Sandwich Islands from 1832.

**Lyman,** PHINEAS, 1716–1774. Commander of Conn. troops in the French war, 1755–62.

**Lyman,** THEODORE, 1792–1849. Mayor of Boston 1834–35; founder of the Mass. Reform School. *Hartford Convention*, 1823; *Diplomacy of the U. S.*, 1826.—His son, THEODORE, b. 1833, was Fish Commissioner of Mass. 1865–82 and M.C. 1883–85. He has long been connected with the Museum of Comparative Zoölogy at Cambridge, and has pub. sundry monographs.

**Lymph.** Clear coagulable fluid containing a large number of bodies (leucocytes) resembling white blood corpuscles and found in the lymphatics. It is derived from the digested food by the lacteals and also by absorption from the tissues, and is discharged into the larger (generally the sub-clavian) veins of the neck through the thoracic ducts. Lymphatic vessels are those which convey lymph to the above ducts; lymphatic spaces are open spaces in the connective tissues connected with the lymphatic vessels; and lymphatic glands are collections of glandular tissues in the course of the vessels, which are largely concerned in the formation of the white blood corpuscles. See KOCH'S LYMPH and ANTITOXIN.

**Lymphatics.** See LYMPH.

**Lynch,** PATRICIO, 1824–1886. Chilian naval officer, of Irish parentage; prominent and ruthless in the war with Peru 1880–81; Gov. of Lima 1881–83; Minister to Spain 1884.

**Lynch,** THOMAS, 1749–1779. Delegate to Congress from S. C. 1776; signer of the Declaration of Independence.

**Lynch,** THOMAS TOKE, 1818–1871. English hymnist. His *Rivulet*, 1855, was violently attacked. His finest lyrics are in the 3d. ed 1868; many of them are in use.

**Lynchburg.** City of Campbell co., Va., on James River near its exit from the Blue Ridge; founded 1786. Its principal industry is the manufacture of tobacco. Pop., 1890, 19,709.

**Lynch Law.** Informal execution of real or supposed criminals by private citizens; frequent in the Southern and Western States, and excused on grounds of the delay, expense and uncertainty of justice through the forms of law, and in some regions by the prevalence of outrages on women. Term derived from Col. Charles Lynch, of Virginia, 1735–1796.

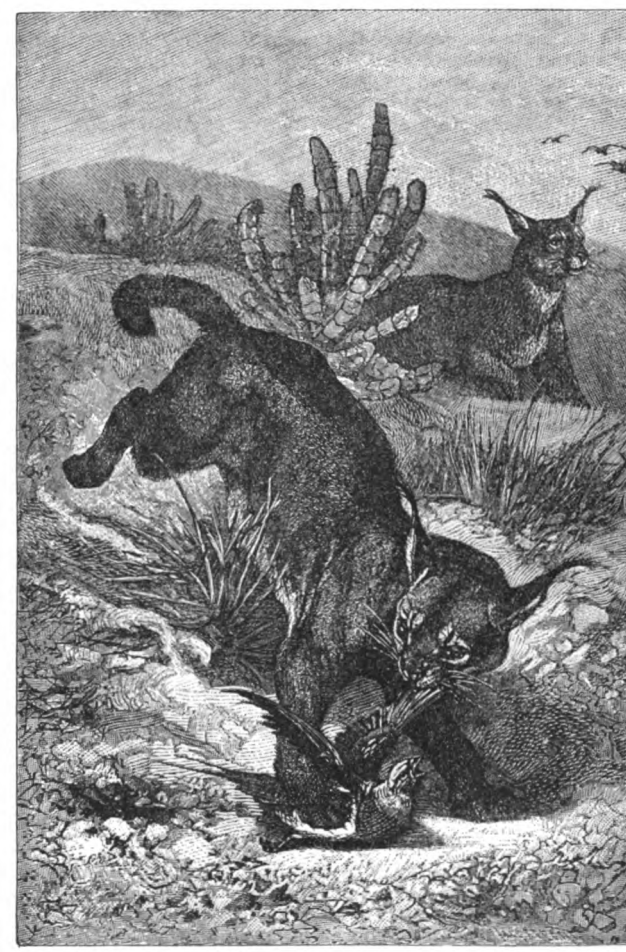
**Lyndhurst,** JOHN SINGLETON COPLEY, LORD, 1772–1863. Son of the artist, and b. in Boston; M.P. 1818; Solicitor-gen. and Knight 1819; Atty.-gen. 1824; Baron 1827; Lord Chancellor 1827–30, 1834–35, and 1841–46; Chief Baron of the Exchequer 1830–34. He was a brilliant speaker, an able lawyer, and a stiff Tory.

**Lyndsay,** SIR DAVID, ab.1490–1555. Scottish poet. *The Dreme; The Monarchie; Satyre of the Three Estates; Squire Meldrum.*

**Lynedoch,** THOMAS GRAHAM, LORD, 1748–1843. Scottish officer, distinguished in Spain 1809–13; Baron 1814, General 1821.

**Lynn.** City of Essex co., Mass., upon the n. shore of Mass. Bay, 10 m. n.e. of Boston; founded 1629, chartered 1850. Its leading industry, for which it is well known, is the manufacture of boots and shoes. Pop., 1890, 55,727.

**Lynx.** Properly, Persian lynx (*Felis caracal*), size of a fox.



Persian Lynx.

bright brown above, with black on tip of tail; found from Central India to w. Africa. But any large ferile cat smaller than

a leopard, having long limbs, stumpy tail, tufted ears, linear pupils when contracted, fur long and soft, color brown or gray and spotted, is usually thus designated. They are arboreal and attack sheep and poultry. The species are not completely differentiated yet. *F. rufa* is the Wildcat of the U. S.; *F. canadensis* is the Lynx of Canada; and there are two species on the Pacific coast. There is a Northern and a Southern species in Europe, likewise in Asia. See FELIDÆ.

**Lyon,** MARY, 1797–1849. Founder, 1837, and head of Mt. Holyoke Seminary at S. Hadley, Mass., the most noted girls' school of that era. Many of her pupils became foreign missionaries.

**Lyon,** MATTHEW, 1746–1822. Irish-American inventor, speculator, and radical; M. C. from Vt. 1797–1801, and from Ky. 1803–11; imprisoned and fined 1798 for libeling Pres. Adams; Indian agent in Ark. 1820.—His son, CHITTENDEN, 1786–1842, was M. C. from Ky. 1827–35.

**Lyon,** NATHANIEL, U.S.A., 1818–1861. Defender of the Union in Mo.; killed at Wilson's Creek Aug. 10; early model of patriotic devotion in the Civil War.

**Lyon Court.** Scottish court of Heraldry.

**Lyonesse.** Mythical land from which came King Arthur of the Round Table; between Land's End and the Scilly Isles; now under water.

**Lyons.** City of e. France, at the junction of the Rhone and Saone; second of the Republic in wealth and population; known for its manufactures of silk goods, with about 80,000 hand-looms and 20,000 power-looms, the value of the product being $200,000,000. The raw silk is obtained one-half from China and Japan, and the balance from Italy, the Levant, and France, the annual value being ab. $10,000,000. It also has extensive chemical and other industries. Founded by Greeks ab. 59 B.C.; the ancient Lugdunum; capital of the Roman province of Gaul, and of Burgundy 478; taken by Saracens 736; free imperial city 1032; besieged and partly destroyed 1792 for its revolt against the Convention; it was occupied by the Austrians 1814; scene of trade riots in 1831, 1834, 1849. President Carnot was assassinated here June 24, 1894. The felling of the forests on the Vosges Mountains has exposed it to severe inundations, as in 1840 and 1856. It has a University, schools of art and industrial science, museums of art and natural history, and a public library of 108,000 vols. Pop. 438,100.

**Lyons,** EDMUND, BARON, R.N., 1790–1858. Captain 1814; knighted 1835; Minister to Greece 1835–49, to Switzerland 1849–51, and to Sweden 1851–53; Rear-admiral 1850; naval commander 1855, in the Crimean war; Baron 1856; Vice-admiral 1857.—His son and successor, RICHARD BICKERTON PEMELL, D.C.L., 1817–1887, was Minister to the U. S. 1858–65, and to France 1867–87; Viscount 1881, Earl 1887.

**Lyons,** GULF OF. On s. coast of France.

**Lyopomata.** See ECARDINES.

**Lyra.** Constellation of the northern heavens; mean right ascension $18^h$ 45′, mean declination 37°.

**Lyra,** NICOLAUS DE, ab.1270–1340. French biblical expositor; provincial of the Franciscans 1325. *Postillæ perpetuæ*, pub. 1471–72.

**Lyre.** Musical instrument in use among the Greeks and undoubtedly brought from Asia. Its invention is ascribed to the Grecian Hermes, who gave it to Apollo, the first that played upon it with method and accompanied it with poetry. The primitive lyre had three strings; Terpander, 673 B.C., added four, and Phrynis, 438 B.C., added two more, making nine. The number was afterward increased to thirteen. The instrument is held between the knees and the strings struck with the fingers or a plectrum. It consisted of a tortoise-shell, with two upright horns and a wooden cross-piece at the upper ends, to which the strings were attached, the other ends of the strings being fastened to the shell and with a bridge to raise the strings from the shell. The number of notes was the same as the strings, as the latter could not be stopped by the fingers.

**Lyre Bird** (MENURA). Australian, Passerine bird, somewhat resembling a pheasant, but with long tarsi and long, nearly straight claws. The tail of the male is striking. There are 16 rectrices: the two outer ones have close-set barbs and broad web: they are shaped like the frame of a lyre. The two central ones have very narrow web. The others are hair-like with long barbs set far apart. The tail is displayed during song. It is shed in Oct. and renewed in June. These birds live in dense brush, and escape by running. They can mock the voices of other animals. A single egg is laid in a nest of sticks

Lyre Bird.

attached to the side of a steep rock. They eat insects and live in solitary pairs.

**Lyric Drama.** See OPERA.

**Lyric Poetry.** Important division of metrical compositions, properly including songs and hymns, as intended to be sung, originally to accompaniment of the lyre; extended to ballads, odes, sonnets, and other shorter forms of verse. It has been cultivated in all lands and ages that had any literature, and is the most spontaneous and effective kind of poetry.

**Lysander,** d. 395 B.C. Spartan general and diplomatist, who ended the Peloponnesian war by defeating the Athenian fleet off Ægospotamos 405 B.C., and capturing Athens 404; killed at Haliartus.

**Lysias,** ab.459–ab.379 B.C. Orator at Athens from 412, the first of his time. His 34 speeches extant show great clearness, force and directness.

**Lysias,** d. ab. 161 B.C. General and regent of Syria in absence of Antiochus Epiphanes; defeated by Judas Maccabeus 166 and 165 B.C.

**Lysicrates.** See CHORAGIC MONUMENT.

**Lysigenic.** Formation of intercellular spaces in vegetable tissues by the breaking down of cells already completed.

**Lysimachus,** ab. 361–281 B.C. One of Alexander's gen-

Tetradrachm of Lysimachus.

erals; ruler of Thrace 323, and of much of Asia Minor 301; defeated by the Getæ 292.

**Lysippus,** 4th cent. B.C. Most distinguished Greek sculptor of his time; creator of the later types of Hercules. The athlete with the strigil (*Apoxyomenus*) in the Vatican and the *Mars* of the Ludovisi Villa are copies from lost originals by him. His portrait statues of Alexander was so admirable that the king desired to be portrayed in bronze by no other artist.

**Lyskander,** KLAUS, ab.1558–1623. First historian of Danish literature.

**Lysons,** DANIEL, F.R.S., 1762–1834. English antiquarian. *Environs of London*, 5 vols., 1792–1800. The incomplete *Magna Britannia*, 6 vols., 1806–22, was partly by his brother SAMUEL, 1763–1819, who wrote also on *Roman Antiquities*, 1797–1817.

**Lyssoflagellata.** Sub-class of *Flagellata*, including the orders *Monadidea*, *Euglenoidea*, *Heteromastigoda*, *Isomastigoda*, and *Phytomastigoda*. Numerous large families are included. The ordinary flagellated *Infusoria* belong to this group.

**Lyssophobia.** Diseased condition resembling hydrophobia, occasionally seen in individuals who have been bitten by sound animals or imagine they have been exposed in some way to the contagion of hydrophobia.

**Lythraceæ.** Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Dicotyledons*, comprising 33 genera and ab. 365 species, growing in the tropics, especially of America, a few widely distributed throughout the temperate regions of the earth; called the Loosestrife family.

**Lystra.** City of Lycaonia, s. Asia Minor, where St. Paul was offered divine honors, and then stoned (Acts xiv.).

**Lyte,** HENRY FRANCIS, 1793–1847. English hymnist, author of *Abide With Me*, 1847. *Spirit of the Psalms*, 1834.

**Lyttelton,** EDWARD, LORD, D.C.L., 1589–1645. Chief-justice of N. Wales 1621, and of Common Pleas 1640; Knight 1634, Baron 1641; keeper of the great seal 1641, which he carried to the king at York 1642.

**Lyttelton,** GEORGE, LORD, 1709–1773. M.P. 1730, Treasury lord 1744, Baronet 1751, Chancellor 1755, Baron 1756. He won repute as a poet, and pub. in prose *Persian Letters*, 1735–36, *Conversion of St. Paul*, 1747, *Dialogues of the Dead*, 1760, and *Hist. Henry II.*, 4 vols., 1764–67.—His son, THOMAS, 1744–1779, was by some thought to be Junius.

**Lyttleton,** THOMAS. See LITTLETON.

**Lytton,** EDWARD GEORGE EARLE BULWER, BARON, 1803–1873. English novelist of great talent and industry, once esteemed the equal of Dickens and Thackeray; M.P. 1831, Baronet 1838, Baron 1866. *Pelham*, 1828; *Pilgrims of the Rhine*, 1834; *Last Days of Pompeii*, 1834; *Rienzi*, 1835; *Zanoni*, 1842; *Harold*, 1848; *The Caxtons*, 1850; *My Novel*, 1853; *A Strange Story*, 1861; *The Coming Race*, 1871; *The Parisians*, 1873. Also plays, *The Lady of Lyons*, 1838; *Richelieu*, 1838; *Money*, 1848; *Walpole*, 1869; and poems, *The New Timon*, 1846; *King Arthur*, 1848; *Lost Tales of Miletus*, 1867; tr. Schiller, 1844, and Horace, 1869.—His wife, LADY ROSINA (WHEELER), 1802–1882, wrote *Chevely*, 1839, and other novels.

**Lytton,** EDWARD ROBERT, EARL, 1831–1891. Poet, son of the novelist; Viceroy of India 1876–80, Ambassador to Portugal 1874–76, and to France 1887; raised to an earldom 1880. As "Owen Meredith" he wrote much verse, especially *The Wanderer*, 1859, which contains many fine and suggestive passages, and *Lucile*, 1860, long extremely popular *The Ring of Amasis*, an Egyptian romance, appeared 1863.

# M

**Maartens,** MAARTEN. Pen-name of J. van der Poorsen-Schwartz, b. 1857. Dutch novelist who writes in English. *Sin of Joost Avelingh*, 1890; *An Old Maid's Love*, 1891; *God's Fool*, 1892; *A Question of Taste*, 1892; *The Greater Glory*, 1894; *My Lady Nobody*, 1895.

**Maas,** HERMANN, b. 1842. Prof. Freiburg 1877, and Würzburg 1883; writer on surgery.

**Mab.** Fairies midwife. Mentioned by Herrick, Drayton, Ben Jonson, and in *Romeo and Juliet*.

**Mabillon,** JEAN, 1632–1707. French Benedictine, resident in Paris from 1664; author of a history of his order, *Acta Sanctorum*, 9 vols., 1668–1701, and of *De Re Diplomatica*, 1681; editor of several learned works.

**Mabinogion.** Traditional lore held by Welsh bards and communicated to their pupils; in popular usage, Welsh tales or legends, especially those in the *Red Book of Hergest*, tr. 1838–49.

**Mably,** GABRIEL BONNOT DE, 1709–1785. French historian and publicist.

**Mabuse** (GOSSAERT), JAN, ab.1470–1532. Flemish painter, who represents the first influence of Italy on Flemish art. His own works are rather formal and cold in color and otherwise commonplace, but historically important. Good examples are in Berlin.

**Macadam,** JOHN LOUDON, 1756–1836. Scottish magistrate and road trustee, who agitated the question of road improvement and introduced the method of building roads by a covering of broken stones. He received from Parliament £2,000 for his services. *Road Making*, 1820.

**Macadam Road.** Road pavement, introduced 1810, consisting of ab. 12 inches of broken stone compacted together. Telford introduced the modification of forming the lower 6 in. of large stones set on edge, the upper 6 in. being broken stone. Both classes are popularly termed macadam roads. The cost varies from 50 cents to $1.50 per square yard, and the annual cost of maintenance from 5 to 10 cents. The stone should be tough, and thorough rolling is essential to form a solid pavement.

**McAll,** ROBERT WHITAKER, 1821–1893. English Cong. minister, founder 1871 in Paris of an unsectarian mission which now has ab.120 branches throughout France, and many native workers. Its methods somewhat resemble those of the Salvation Army; it has done much good among the poor.

**McAlpine,** WILLIAM JARVIS, 1812–1890. Civil and hydraulic engineer; builder of the stone dock at the U. S. Navy Yard, Brooklyn; State Engineer of N. Y. 1852; Engineer of the Erie Railway 1856–58; Pres. American Society of Civil Engineers 1867.

**Macao.** Portuguese settlement and seaport on an island in the harbor of Canton, China, opposite Hong Kong; made

Gambling House at Macao.

1557. The Portuguese authorities and others form a senate, a governor, and a council, but the government of the native inhabitants is vested in a Chinese mandarin. Pop. ab. 70,000.

**Macaques.** Monkeys of genus *Macacus* and family CYNOPITHECIDÆ (q.v.). They endure captivity well. The common Macaques have long tails, as is usual with arboreal forms; but terrestrial species, like the Barbary ape, have the tails greatly reduced and resemble baboons in appearance and habits. Most of the macaques belong to s.e. Asia. One example is the Wanderoo, having its face encircled with abundant gray whiskers, backed by the long black hair of its head and body. It is 2 ft. long and tail 1 ft.

**Macarius.** 1. D. 391. Egyptian hermit, whose homilies survive. 2. D. 404. Nitrian monk. 3. Bp. of Magnesia ab. 400; author of an apology, *Apokritikos*.

**Macaroni.** Wheat paste in the form of tubes, varying in diameter. Formerly an exclusive product of Italy, but now also made in France. Wheat containing a large percentage of gluten is required. See VERMICELLI.

**Macaronic Verse.** Mixture of Latin with a living language: term first employed by T. Folengo, whose *Maccaronea*, 1517, jumbled Italian with Latin.

**Macartney,** GEORGE MACARTNEY, EARL OF, 1737–1806.

Gov. of Granada, W. I., 1775–79, and of Madras 1781–86; Envoy to China 1792, and to Italy 1795; Knight 1764, Irish Baron 1776, Earl 1794.

**Macassar,** STRAIT OF. Passage between Borneo and Celebes, in the Indian Ocean.

**Macaulay,** THOMAS BABINGTON, LORD, 1800–1859. English essayist, historian and poet; in India 1834–38; Whig M. P. 1830–34, 1839–47, and 1852–57; Cabinet Minister 1839–41; Baron 1857. *Lays of Ancient Rome*, 1842; *Essays*, 1843; *Speeches*, 1853–54; *Letters*, 1876. His *History of England*, 5 vols., 1848–55–61, is but a brilliant fragment, covering little more than the brief reign of James II., but it took the world by storm, exerted wide influence, and, though blamed as partial and superficial, is still valued for its picturesque vividness and unfailing charm of style.

**Macaws.** Large New World parrots of varied and strongly contrasting bright colors, and with long tails. There are ab.

Hyacinth Macaw (*Sittace hyacinthina*).

18 species. Their voice is harsh, they feed on fruits, and stand captivity well. The Great Scarlet Macaw is 3 ft. long, and ranges from Mexico to Brazil.

**Macbeth,** d. 1057. Scottish chieftain, who killed King Duncan 1040 and became King of Scotland; defeated by Malcolm and Siward 1054; slain in battle 1057 by Malcolm and Macduff; celebrated by Shakespeare, whose materials were chiefly legendary.

**Maccabees.** Family of Jewish patriots, who successfully resisted the paganizing efforts of Antiochus Epiphanes.—MATTATHIAS, d. 166 B.C., began the revolt.—His son, JUDAS, d. 160, one of the noblest heroes of history, defeated several Syrian armies, and proved a statesman as well as a great general. His work was carried on by his brothers, JONATHAN, d. 142, and SIMON, d. 135, whose descendants ruled as the Hasmonæan dynasty.

**Maccabees,** BOOKS OF. Two Apocryphal books, received as canonical by the Roman and Greek churches. I. covers the period 175–135 B.C., II., 175–160; these were probably written in the 1st century B.C., and are of historical value. There are two more books, III. and IV., of 1st century A.D., on other subjects, and a so-called 5th, covering Jewish history 184–6 B.C., probably much later: these three are not of importance.

**MacCarthy,** DENIS FLORENCE, 1817–1882. Irish poet, tr. Calderon.

**McCarthy,** JUSTIN, b. 1830. Irish essayist, novelist, and historian: M.P. since 1879, leader of the anti-Parnellites since 1889. His most important works are *History of Our Own Times*, 4 vols., 1879–80, and *The Four Georges*, 1889. Among his novels are *Paul Massie*, 1866, *Dear Lady Disdain*, 1875, and *Camiola*, 1885.

**McCheyne,** ROBERT MURRAY, 1813–1843. Scottish hymnist, pastor at Dundee.

**McClellan,** GEORGE BRINTON, U.S.A., 1826–1885. Major-gen. U.S. Vols. 1861; given command of the entire army by reason of his brilliant services in W. Va.; admirable as an organizer, but more successful in retreat than in advance; removed Nov. 1862 for slowness in pursuing Lee. Much has been pub. both in justification and in criticism of his management of the army. He was Democratic candidate for the Presidency 1864; Engineer in N. Y. 1868–78, and Gov. of N. J. 1878–81. *McClellan's Own Story* appeared 1886.—His father, GEORGE, M.D., 1796–1847, was one of the first surgeons of his time, and chief founder of Jefferson Medical Coll. 1826, and prof. there 1826–38, medical dept. of Pa. Coll. 1839–43. *Principles and Practice of Surgery*, 1847.

**McClelland,** MARGARET GREENWAY, d. 1895. American novelist. *Oblivion*, 1886; *White Heron*, 1892; *Old Post Road*, 1894; *Broad Oaks*, 1894.

**McClernand,** JOHN ALEXANDER, b. 1812. M.C. from Ill. 1843–51 and 1859–61; Brig.-gen. U. S. Vols. 1861; Major-gen. 1862–64, serving in the West.

**McClintock,** SIR FRANCIS LEOPOLD, R.N., LL.D., F.R.S., b. 1819. Arctic explorer, on expeditions 1848, 1850, 1851 and 1857, on the last to learn the fate of Sir John Franklin; knighted 1860; Vice-Admiral 1877, Admiral 1884.

**McClintock,** JOHN, D.D., LL.D., 1814–1870. Prof. Dickinson Coll. 1836–46; ed. *Meth. Quarterly*, 1848–56; pres. Drew Theol. Sem. 1870. He edited sundry classical text-books and, with Dr. James Strong, 4 vols. of a *Cyc. of Biblical, Theol. and Eccles. Literature*, 1867–71.

**McCloskey,** JOHN, D.D., 1810–1885. Bp. of Albany 1847, Abp. of New York 1864, Cardinal 1875. He built the N. Y. Cathedral, and greatly increased the strength of his diocese.

**McClure,** ALEXANDER KELLY, b. 1828. American journalist; founder (1869) and ed. Phila. *Times*. *Lincoln and Men of War Times*, 1892.

**M'Clure,** SIR ROBERT JOHN LE MESURIER, 1807–1873. English navigator, discoverer of the N.W. passage. He accompanied Back 1836 and Ross 1848; commanded, 1850–54, an expedition which crossed from ocean to ocean, but was caught in the ice and rescued by McClintock; was knighted 1854, and made Rear-admiral 1867.

**McCook,** ALEXANDER MCDOWELL, U.S.A., b. 1831. Brig.-gen. U.S. Vols. 1861–65, serving in Va. and the West. Several of his brothers and cousins also served with distinction: the family was called "the fighting McCooks."

**McCormac,** HENRY, M.D., 1800–1886. Irish writer on medical subjects.

**McCormick,** CYRUS HALL, 1809–1884. American inventor. His reaping machine was patented 1834, and improved 1845 and 1858.

**McCosh,** JAMES, D.D., LL.D., 1811–1894. B. in Scotland; prof. Belfast 1851–68; pres. Princeton Coll. 1868–89. *Method of Divine Government*, 1850; *Intuitions*, 1860; *Logic*, 1869; *Scottish Philosophy*, 1874; *Emotions*, 1880; *Development*, 1883; *Psychology*, 1886; *Our Moral Nature*, 1893; *Philosophy of Reality*, 1894.

**McCrie,** THOMAS, D.D., 1772–1835. Minister in Edinburgh from 1795; founder of the "Old Lights" or anti-burghers 1804; biographer of Knox, 1811, and Melville, 1819; historian of the Reformation in Italy and Spain, 1827–29.—His son, THOMAS, D.D., LL.D., 1798–1875, prof. in London 1856, wrote his *Life*, 1840, that of A. Henderson, 1846, and other books.

**McCulloch,** BEN, 1811–1862. Pioneer in Texas; useful to Gens. Taylor and Scott in the war with Mexico; Brig.-gen. C.S.A. 1861; killed at Pea Ridge, Mo.

**McCulloch,** HORATIO, 1806–1867. Scottish landscape painter.

**McCulloch,** HUGH, 1808–1895. U.S. Controller of the Currency 1863–65; Sec. Treasury 1865–69 and 1884–85. *Men and Measures*, 1888.

**McCulloch,** JOHN, 1773–1835. Scottish geologist.

**MacCulloch,** JOHN RAMSAY, 1789–1864. Scottish political economist; Prof. Univ. Coll., London, 1828. He carried the *laissez-faire* doctrines to an extreme. He compiled a *Dict. of Commerce*, 1832, and a *Dict. of Countries, Places*, etc., 1841.

**McCullough,** JOHN EDWARD, 1837–1885. Irish-American actor, imitator and successor of Edwin Forrest.

**McCurdy,** JAMES FREDERICK, b. 1847. Prof. Toronto 1886; Orientalist and O. T. commentator. *Aryo-Semitic Speech*, 1881.

**Macdonald,** ETIENNE JACQUES JOSEPH ALEXANDRE, 1765–1840. French general, prominent at Wagram; made Duke of Tarentum and Marshal 1809; defeated by Blücher at Katzbach, 1813; Peer 1815.

Marshal Macdonald.

**Macdonald,** FLORA, 1722–1790. Scottish heroine, who enabled Charles Edward Stuart to escape after Culloden. 1746.

**Macdonald,** GEORGE, LL.D., b. 1824. Scottish novelist and poet. *Phantastes*, 1858; *David Elginbrod*, 1862; *The Portent*, 1864; *Alec Forbes*, 1865; *Annals of a Quiet Neighborhood*, 1866; *Robert Falconer*, 1868; *Unspoken Sermons*, 1867–89; *Sir Gibbie*, 1879.

**Macdonald,** SIR JOHN ALEXANDER, D.C.L., 1815–1891. Conservative leader in Canada, knighted 1867; active in procuring federation 1867; champion of the protective system; Atty.-gen. and Premier of Upper Canada 1856–62 and 1864–67; repeatedly Premier of the Dominion.

**Macdonough,** THOMAS, U.S.N., 1783–1825. Commander 1813; victor over a superior British naval force at Plattsburgh, N. Y., Sept. 11, 1814.

**MacDowell,** EDWARD ALEXANDER, b. 1861. Prof. of Music at Columbia 1896. His most striking compositions are the symphonic poems, *Hamlet and Ophelia* and *Lancelot and Elaine*; an orchestral suite, *In the Haunted Forest;* a second suite, partly based on Indian melodies; two pianoforte concertos in A minor and D minor; and the sonatas *Tragica* and *Eroica*.

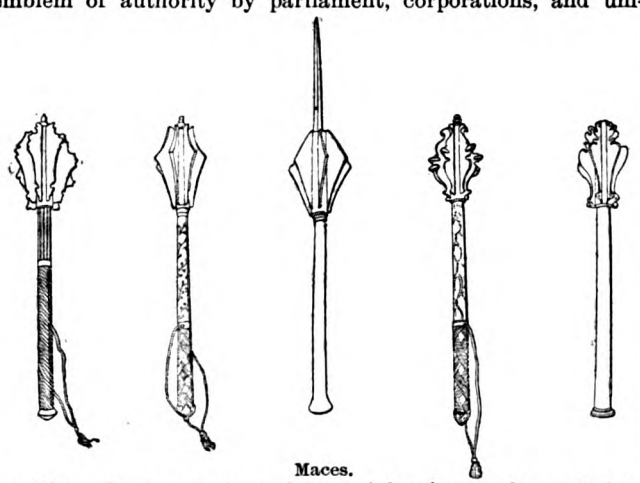
**McDowell,** IRVIN, U.S.A., 1818–1885. Brig.-gen. 1861, serving in Va. till 1864.

**Macduff,** JOHN ROSS, D.D., b. 1818. Scottish hymnist.

**McDuffie,** GEORGE, ab. 1788–1851. M.C. 1821–34; Gov. of S. C. 1834–36; leading champion of nullification.

**Mace.** See NUTMEG.

**Mace.** Spiked club used in Mediæval battles, and as an emblem of authority by parliament, corporations, and universities. It was much used by knights in the days of plate armor, as a strong blow would drive the spike through the plate; also by priests, who were forbidden to carry swords.



Maces.

**Macé,** JEAN, 1815–1894. French author, especially of juvenile books; Senator 1883. *A Piece of Bread*, 1861; *First Books*, 1869; *France*, 1881. He did much for communal libraries and education, especially through the Educational League, which he founded and conducted.

**Macedo,** JOAQUIN MANOEL DE, b. 1820. Brazilian poet and dramatist.

**Macedo,** JOSÉ AGOSTINHO, 1761–1831. Portuguese poet and critic.

**Macedonia.** Ancient kingdom n. of Thessaly and the Ægean Sea. It rose to importance under Philip II., father of Alexander the Great, 359–336 B.C., who greatly extended its boundaries, and became virtual master of all Greece, which its kings governed till conquered by Rome 168 B.C. It was made a Roman province 145 B.C. Here the Gospel was first preached in Europe (Acts xvi.).

**Macedonian Language.** Idiom of Macedonia only known through loan words and glosses. Probably either a Greek dialect or a branch of the Indo-European, closely related to the Greek.

**McEntee,** JERVIS, 1828–1891. N.A. 1861. American landscape painter.

**Maceration.** Process of exposing tissues to the action of solutions of various substances, by which the individual cells are separated.

**Macfarlane,** CHARLES, d. 1858. Scottish historical writer.

**Macfarlane,** JAMES, 1819–1885. American geologist. *Coal Fields of America*, 1873; *Geologist's Traveling Handbook*, 1879.

**Macfarlane,** ROBERT, 1734–1804. Scottish journalist. *Hist. Reign of George III.*, 1770–96; tr. *Poems of Ossian*, 1807.

**Macfarren,** SIR GEORGE ALEXANDER, 1813–1887. English musician; Prof. Cambridge 1875; knighted 1883; principal of the Royal Academy of Music. He composed several operas, the best of which was *Robin Hood*, 1860, and a number of oratorios, cantatas, overtures, and smaller pieces.

**MacGahan,** JANUARIUS ALOYSIUS, 1844–1878. American war correspondent. *Campaigning on the Oxus*, 1874; *Northern Lights*, 1876. With E. Schuyler he witnessed and exposed the Turkish atrocities in Bulgaria 1876.

**McGee,** THOMAS D'ARCY, 1825–1868. Irish-Canadian author and Minister of State, murdered for opposing Fenianism.

**McGee,** W. J., b. 1853. Connected with U. S. Geological Survey 1881–93; author of various reports; head of Bureau of Ethnology 1893.

**McGill,** JAMES, 1744–1813. Scottish-Canadian merchant, founder of McGill Coll., Montreal.

**McGill College and University.** In Montreal; chartered 1821, reorganized 1852. It has 52 profs., with 41 assistants; educates women in separate classes; has in Montreal 4 theological schools, besides affiliated colleges at Quebec, Richmond and Stanstead; had, in 1895, 1,267 students, of whom 395 (145 women) were in arts, 205 in applied science, 412 in medicine, and 168 in the normal department. It has also a law school and a veterinary school: in libraries, 60,000 vols.

**McGillivray,** ALEXANDER, 1740–1793. Creek Indian chief; three-fourths white, and educated; allied with the Spaniards in Fla. He gave the Americans much trouble, but made a treaty 1790 and was commissioned Brig.-gen.

**McGillivray,** WILLIAM, 1796–1852. Prof. of Natural History at Edinburgh 1826, and Aberdeen 1841. *Lives of Zoölogists*, 1834; *Hist. British Birds*, 5 vols., 1837–62.

**McGlynn,** EDWARD, b. 1837. R. C. pastor in New York, under censure 1887–93; supporter of Henry George's tenets; pres. Anti-poverty Society 1887.

**MacGregor,** JAMES MACNAUGHTAN, D.D., b. 1830. Prof. New Coll., Edinburgh, 1868–81; pastor in New Zealand 1882; commentator and theological writer.

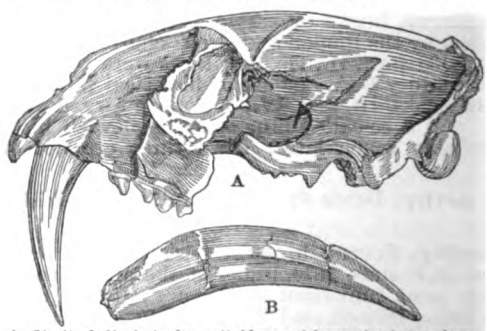
**MacGregor,** JOHN, 1797–1857. Scottish economist and historical writer, long in Canada. *Commercial Statistics*, 5 vols., 1844–50.

**MacGregor,** JOHN, 1825–1892. English traveler, whose voyages in the *Rob Roy* canoe were well known through his four books, 1866–69. He did much for education and organized beneficence.

**M'Gregor,** ROBERT. See ROB ROY.

**Macha,** KAREL HYNEK, 1810–1836. Bohemian poet.

**Machairodus.** Genus of feline quadrupeds, with upper canine teeth very long, trenchant, sharp-pointed, and saber-shaped; found in the Miocene of Auvergne and Eppelsheim, in the Pliocene of the Val d'Arno, and in cave breccia in Devonshire.




A, Skull of *Machairodus cultridens*, without the lower jaw; B, Canine tooth of the same. Pliocene, France.

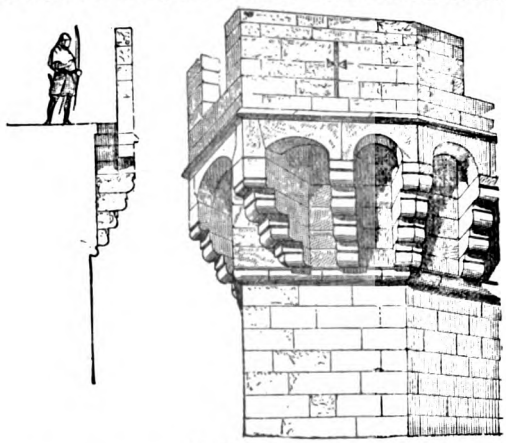
**McHale,** JOHN, D.D., 1791–1881. R. C. Abp. of Tuam, Ireland, 1834; prominent and influential in matters ecclesiastical, political, educational, and literary.

**Machaon.** Son of Asclepius; surgeon in the Trojan war.

**Machault,** GUILLAUME DE, 14th cent. French poet.

**Machiavelli,** NICCOLO DI BERNARDO, 1469–1527. Italian author; Sec. of the Florentine Republic 1498–1512. His *Florentine History* covers the period 1215–1499; his *Art of War* has been highly valued. Far better known is his *Prince*, which, after the ideas of his time, defends absolutism and treachery, and sets up Cesar Borgia as an example. It was written for the Medici, apparently in all seriousness, and not as a satire.

**Machicolations.** Openings formed at the tops of castles and fortifications, for the purpose of defense, by setting the parapet out on corbels, the interval between the corbels being

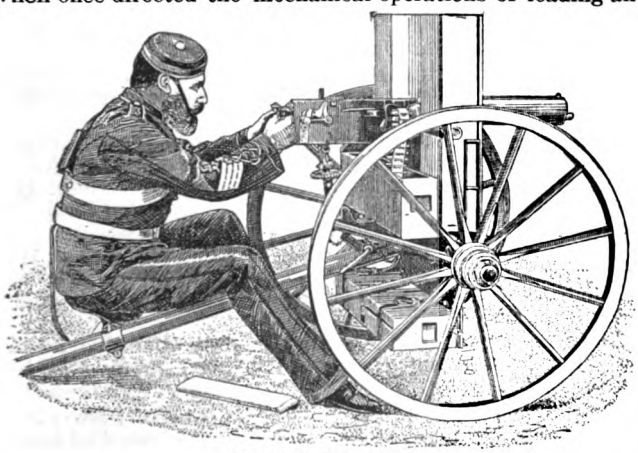


Machicolations.

left open to allow missiles to be thrown down. They took the place of the Hourds of an earlier period. Often reproduced in Modern Gothic.

**Machine.** Instrument or mediary by which energy is transformed or transferred directly or indirectly from one body to another. The agent which loses the energy is sometimes called the power; the body which receives it is the weight. Hence the rule for all machines, no matter how complex: the power multiplied by the distance through which it moves is equal to the weight multiplied by the distance through which it moves. The simple machines are the inclined plane, lever, pulley, wheel and axle, screw, and wedge.

**Machine Gun.** Gun loaded and fired by machinery. The Gardner, Maxim, Gatling, Colt, and Hotchkiss revolving cannon are the best developed types. The gun consisting of several barrels, the feed device, and working machinery, is solidly mounted on wheels for ease of transportation: it belongs to the infantry, since it uses small arm ammunition and cannot cope with field artillery. It has no appreciable recoil, so that when once directed the mechanical operations of loading and



Maxim Machine Gun.

firing do not disturb the aim or working, or prevent its being rapidly directed upon any desired point. Such guns are valuable against a column of infantry, in defense of roads, bridges, or other defiles, to sweep the ditches and faces of permanent works, and for their moral effect in street fighting against mobs and rioters. In naval service they are mounted in the tops of vessels, to sweep the enemy's decks, repel boarders, and the like.

**Machinery.** Devices by which the motion derived from the action of the elementary forces is transmitted and transformed to adapt the motion and the power to do industrial work at the tool or operating point. There will be machinery of transmission for carrying power from the point whence it is derived to the points where it is to be used, and for conversion or transformation (usually called mechanism) by which a number of different motions are made to result from a few simple motions of the few primary motors.—In Economics, mechanical devices by which production can be increased and cheapened to an extent limited only by the amount and value of the capital invested and the efficiency of the labor used in connection with the machinery.

**Machinery,** ERA OF. Last century of the history of w. Europe and America; so called from the enormous use of machinery in production as compared with hand labor.

**Machines.** See ELEMENTARY MACHINES.

**Machines of War,** ANCIENT. See BALLISTA, BATTERING RAM, and JAVELIN.

**Macias,** called EL ENAMORADO, 15th cent. Spanish troubadour.

**Maciejowski,** WACLAW ALEXANDER, 1793–1883. Prof. Warsaw; writer on Polish history and literature.

**McIlvaine,** CHARLES PETTIT, D.D., LL.D., D.C.L., 1799–1875. Bp. of Ohio 1832. *Evidences*, 1832; *Oxford Divinity*, 1841.

**McIntosh,** LACHLAN, 1725–1806. General in the American Revolution, serving in the South and West; in Congress 1784. —His grand-niece, MARIA JANE, 1803–1878, wrote novels and tales for the young.

**Mack,** KARL, FREIHERR VON, 1752–1822. Austrian general, defeated by the French at Naples 1798; condemned to death and imprisoned till 1808 for his surrender of 80,000 men at Ulm, Oct. 17, 1805.

**Mackay,** CHARLES, LL.D., 1814–1889. Scottish lyric poet, author of the song, "A Good Time Coming." Among his prose works are *Popular Delusions*, 1841, and *Gaelic Etymology*, 1878.—His son, GEORGE ERIC, is also a poet.

**Mackay,** GEORGE L., D.D., b. 1844 in Canada. Missionary in Formosa from 1871. *In Far Formosa*, 1895.

**McKean,** THOMAS, LL.D., 1734–1817. Judge in Del. 1765; in Congress 1774–83; signer of the Declaration of Independence; pres. of Del. 1777, and author of its constitution; "hunted like a fox" by the British; Chief-Justice of Pa. 1777–99; Gov. of Pa. 1799–1808.

**McKeesport.** City of Allegheny co., Pa., on the Monongahela, in a region of soft coal and natural gas. It has large iron-works and other manufactures. Pop., 1890, 20,741.

**MacKellar,** THOMAS, b. 1812. Type-founder and poet in Phila. *American Printer*, 1866; *Hymns*, 1883.

**McKendree,** WILLIAM, D.D., 1757–1835. First M.E. bishop in the U. S., 1808; revivalist in Ky. and Tenn.

**Mackenzie,** SIR ALEXANDER, ab. 1755–1820. Scottish explorer of n.w. British America 1789–93; discoverer of the Mackenzie River; knighted 1802. *Voyages*, 1801.

**Mackenzie,** ALEXANDER, 1822–1892. Scottish-Canadian Liberal leader; Premier of the Dominion 1873–78.

**Mackenzie,** SIR ALEXANDER CAMPBELL, b. 1847. British composer; principal Royal Academy of Music 1888; knighted 1895. Operas: *Colomba*, 1883, *The Troubadour*, 1886; oratorio: *Rose of Sharon*, 1884; cantatas: *Jason*, 1882, *The Bride*, 1886, *The Story of Sayid*, 1886.

**Mackenzie,** SIR GEORGE, 1636–1691. Scottish lawyer and judge, knighted ab. 1667; M.P. 1669, king's advocate 1677; noted for scholarship and subserviency. He defended Argyle 1661, tried alleged witches, and earned much ill-fame by prosecuting Covenanters. *Laws and Customs of Scotland*, 1678; *Institutions of Laws*, 1684. *Works*, 1716–22.

**Mackenzie,** HENRY, 1745–1831. Scottish novelist and essayist. *Man of Feeling*, 1771; *Julia de Roubigné*, 1777.

**Mackenzie,** SIR MORELL, M.D., 1837–1892. English specialist in throat diseases; knighted 1887 for attendance on the German crown prince; pres. Laryngological Society. *Growths in the Larynx*, 1871; *Diseases of the Throat*, 1880; *Hygiene of the Vocal Organs*, 1886.

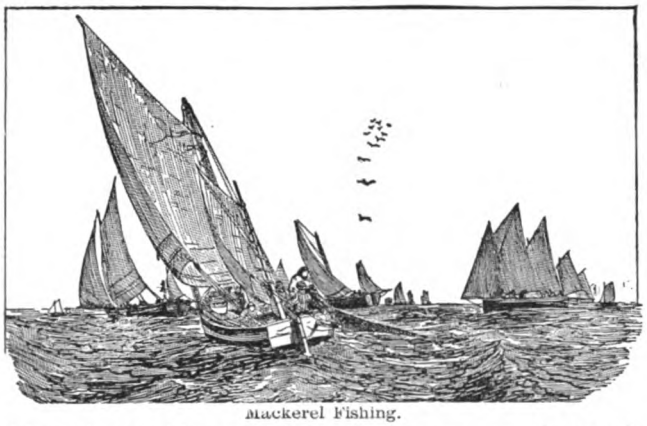
**Mackenzie,** ROBERT SHELTON, LL.D., D.C.L., 1809–1880. Irish-American journalist.

**Mackenzie,** WILLIAM LYON, 1795–1861. Scottish-Canadian journalist and reformer; leader of an insurrection 1837; in exile till 1849.

**Mackenzie River.** Largest river of Canada. It rises in the Rocky Mountains and in the Lacustrine region n. of the Great Plains, in numerous branches, and, after passing into several lakes, finds its way by a n.w. course to the Arctic Ocean. The name is applied only to that part below Great

Slave Lake. The entire length is 2,300 miles, the area drained 590,000 sq. m.

**Mackerel.** Acanthopterous fish of various species, constituting the family *Scombridæ*. The mackerel of commerce has its back marked by broken bands of small spots, averages nearly a foot in length, and abounds on the two shores of the N. Atlantic; their migrations are determined mainly by the temperature of the water, as they go into deep water on approach of winter. Jelly fishes are their principal summer food. Their eggs, spawned in June, develop at the surface of the open sea. By autumn the young is 6 in. long: full maturity is reached in four years. They are caught by means



Mackerel Fishing.

of large boats, either with lines or seines: young salted mackerel and menhaden are used as bait. 3,000 fish have been taken in one day by one man. Half of the fishing interest of our coast is involved in mackerel catching. In 1892, 17,041,736 lbs. were caught. The Spanish mackerel (*Scomberomorus* or *Cybium maculatus*) has eight or nine finlets behind the dorsal; along the sides are small round bronze spots. It is common s. of Cape Cod, but is not easily caught. Its eggs float during development.

**Mackerel Sky.** Cloud formation in which small clouds of uniform appearance and size are arranged in rank and file.

**Mackey,** Albert Gallatin, M.D., 1807–1881. American writer on Freemasonry, of which his *Lexicon*, 1845, was increased to an *Encyclopædia*, 1875.

**McKim,** James Miller, 1810–1874. American reformer, active against slavery.—His son, Charles Follen, b. 1847, was architect of the Boston Public Library and other well-known buildings.

**Mackinaw,** or Mackinac (formerly Michilimackinac). Island and village of Mich., settled by the French 1699; scene of the massacre by Pontiac 1763. Also, strait which joins Lakes Michigan and Huron.

**McKinley,** William, b. 1844. M.C. 1877–91; champion of protection; chairman of the committee which framed the tariff of 1890; Gov. of Ohio 1892–95; Pres. 1897. *Speeches*, 1893.

**Mackintosh,** Sir James, 1765–1832. Scottish advocate in London, celebrated for his *Vindiciæ Gallicæ*, 1791, and his defense of Peltier, 1803; knighted 1804; judge in India 1805–12; M.P. 1813; Prof. Haileybury Coll. 1818–24. *Hist. England*, 1830; *Progress of Ethical Philosophy*, 1831. *Works*, 1854.

**Macklin,** Charles, 1697 (or 1690)–1797. Irish actor and playwright, eminent from 1741 as Shylock.

**Macknight,** James, D.D., 1721–1800. Pastor in Edinburgh 1772. *Harmony of the Gospels*, 1756.

**Mackonochie,** Alexander Heriot, 1825–1887. Vicar at Holborn and London Docks, noted for devoted work among the poor and extreme ritual; prosecuted by Ch. Association 1867–82.

**McLane,** Louis, 1786–1857. M.C. from Del. 1817–27; U.S. Senator 1827–29; Minister to England 1829–31 and 1845–46; Sec. of the Treasury 1831–33, and of State 1833–34; pres. Baltimore and Ohio R. R. 1837–47.—His son, Robert Milligan, b. 1815, was M.C. from Md. 1847–51 and 1879–83; Commissioner to China and Japan 1854–56; Minister to Mexico 1859–61, and to France 1885–89; Gov. of Md. 1884–85.

**Maclaren,** Ian. See Watson, John.

**Maclaurin,** Colin, F.R.S., 1698–1746. Prof. of Mathematics at Aberdeen 1717, and Edinburgh 1725. *Geometrica Organica*, 1719; *De Linearum Geometricarum Proprietatibus*, 1720; *Fluxions*, 1742; *Algebra*, 1748; *Newton's Discoveries*, 1748.

**Maclaurin's Theorem.** Formula for developing a function of one variable in a series of ascending powers of that variable, with constant coefficients; enunciated by James Stirling 1730; specific form of Taylor's Theorem. If f(0):f′(0):f″(0)., etc., represent what f(x) and its derivatives become when x=0. Maclaurin's formula is

$$f(x)=f(o)+f'(o).x+f''(o).\frac{x^2}{\lfloor 2}+f'''(o).\frac{x^3}{\lfloor 3}\ldots\ldots+$$

$$f^{(n-1)}(o).\frac{x^{n-1}}{\lfloor n-1}+\begin{matrix} f^n(\theta x)\frac{x^n}{\lfloor n} \text{ (or)} \\ f^n(\theta x)\frac{(1-\theta)^{n-1}x^n}{\lfloor n-1} \end{matrix}$$

**McLaws,** Lafayette, b. 1821. Brig.-gen. C.S.A. 1861; Major-gen. 1862; engaged in Va., Tenn., and Ga.

**Macle.** See Andalusite.

**McLean,** John, LL.D., 1785–1861. M.C. 1813–16; Judge Ohio Supreme Court 1816–22; Postmaster-gen. 1823–29; Associate Justice U.S. Supreme Court from 1829. His opinion in the Dred Scott case was in strong dissent from that of the Court.

**McLean,** Letitia. See Landon, L. E.

**McLean,** Sarah Pratt. See Greene, Mrs. Sarah.

**McLennan,** John Fergus, 1827–1881. Scottish historical investigator. *Primitive Marriage*, 1865; *Studies*, 1876; *Polyandry*, 1877; *Patriarchal Theory*, 1885.

**McLeod,** Henry Dunning, b. 1821. Scottish writer on banking, 1856, and political economy, 1858–59.

**McLeod,** Malcolm, 1788–1849. Explorer of British America, in the Hudson Bay Co.'s interest, and opener of trade routes to the Pacific.—His son, Malcolm, b. 1821, has written much on that region.

**Macleod,** Norman, D.D., 1812–1872. Pastor in Glasgow from 1851; ed. *Christian Mag.*, 1850–59, and *Good Words* from 1860. Besides sermons and essays, he pub. tales, as *Gold Thread*, 1861; *Wee Davie*, 1864; *The Starling*, 1867.—His brother, Donald, b. 1821, pastor in Glasgow 1869, wrote his *Memoir*, 1872, and has edited *Good Words* since 1872.

**Maclise,** Daniel, 1806–1870. Irish historical painter, R.A. 1840. He has frescoes in the Houses of Parliament.

**Maclure,** William, 1763–1840. Geologist, who undertook alone a survey of the U.S., visiting nearly all parts, and crossing the Alleghanies fifty times by 1809. His results were laid before the Am. Philosophical Society. He founded a school at New Harmony, Ind., 1824, and died in Mexico.

**Maclurin.** $C_{13}H_{10}O_6+H_2O$. Pale yellow substance, obtained from the yellow dye-wood fustic. A yellow dye stuff, sold as fustin, is prepared by the action of diazobenzine chloride upon maclurin.

**McMahon,** Marie Edme Patrice Maurice de, 1808–1893. French general, distinguished in the Crimea 1855 and in Italy 1859; Marshal and Duke of Magenta 1859; Gov.-gen. of Algeria 1864; in command of first corps 1870; defeated at Worth, wounded and captured at Sedan; Commander 1871, to suppress the Commune; Pres. of the Republic 1873–79.

**McMaster,** John Bach, Ph.D., b. 1852. Prof. Univ. Pa. 1883. *Hist. People of the U.S.*, 1883, vol. 4, 1895; *Franklin*, 1887.

**Macmillan,** Daniel, 1813–1857, and Alexander, 1815–1896. Scottish brothers, founders of a great publishing house in London. *Macmillan's Magazine* was founded 1859.

**Macmillan,** Hugh, D.D., LL.D., b. 1833. Pastor at Glasgow 1864–78, and since at Greenock; prolific writer. *Bible Teachings in Nature*, 1866.

**MacMonnies,** Frederick, b. 1864. American sculptor, living in Paris; designer of the Columbia Fountain for the World's Columbian Exposition, Chicago. His *Nathan Hale* (bronze), in City Hall Park, N. Y., was dedicated 1894. His *Bacchante* was purchased by the Luxembourg 1895.

**MacMurrogh,** Dermot, d. 1170. King of Leinster 1140–68; restored 1170 by "Strongbow," Earl of Pembroke, who held his domains as in fief from Henry II. Thus English rights in Ireland began.

**MacNab,** Sir Allan Napier, 1798–1862. Canadian soldier, knighted 1838 for suppressing a rebellion; Premier 1854–56. Baronet 1857.

**MacNeill,** Hector, 1746–1818. Scottish lyric poet.

**McNeill,** Sir John, D.C.L., 1795–1883. British Ambassador to Persia 1836–44; Privy Councilor 1857. *Russia in the East*, 1854.

**McNeill,** William Gibbs, 1800–1853. U.S. officer till 1837; engineer, prominent in railway construction.

**Macomb,** Alexander, U.S.A., 1782–1841. Brig.-gen. 1814, commanding at Plattsburg, N. Y., Sept. 11.

**Macon.** City of Bibb co., Ga., on Ocmulgee River, at the head of navigation. It has three colleges and considerable manufactures. Pop., 1890, 22,746.

**Macon.** See BURGUNDY WINES.

**Macon,** NATHANIEL, 1757–1837. M.C. from N. C. 1791–1815; Speaker 1801–6; U. S. Senator 1815–27.

**Macpherson,** JAMES, 1738–1796. Scottish author or translator of poems ascribed to Ossian. The alleged originals not appearing, *Fingal*, 1762, and *Temora*, 1763, were denounced as forgeries by Dr. Johnson; but Scottish critics long contended that they were genuine.

**McPherson,** JAMES BIRDSEYE, U.S.A., 1828–1864. Major-gen. U. S. Vols. 1862; with Grant in the Tenn. and Vicksburg campaigns, then with Sherman, commanding Army of the Tennessee; killed at Atlanta.

**Macquer,** PIERRE JOSÈPHE, 1718–1784. French phlogistonist, teacher in the Jardin des Plantes.

**Macrauchenii dæ.** Family of *Perissodactyla*, comprising the single genus *Macrauchenia*, from the late Tertiary deposits of S. America. The feet are three-toed, there are cervical vertebræ as in the *Camelidæ*, and the skull is horse-like. They were large animals.

**Macready,** WILLIAM CHARLES, 1793–1873. English actor of high rank and character, prominent in Shakespearian parts 1837–51. His last appearance in the U. S., May 7, 1849, provoked, through the rivalry of Forrest, a disgraceful riot in New York.

**Macrinus,** MARCUS OPELIUS SEVERUS, 164–218. Roman Emperor 217, having assassinated Caracalla.

**Macrobii.** 1. People of Ethiopia described by Herodotus as living on the South Sea, at the ends of the earth. Said to live 120 years and more, and to use gold as the commonest of metals. Some have identified them with the Abyssinians, others with the inhabitants of Kordofan. 2. Hyperboreans.

**Macrobiotidæ.** See TARDIGRADA.

**Macrobius,** AMBROSIUS THEODOSIUS, 5th cent. Latin grammarian, from whom we have *Saturnaliorum Conviviorum Libri VII.*, a collection of antiquarian and linguistic discussions, and a commentary on Scipio's Dream.

**Macrochires.** See CYPSELI.

**Macrocosm.** Universe, as distinct from man.

**Macrodactyli.** See PALUDICOLÆ.

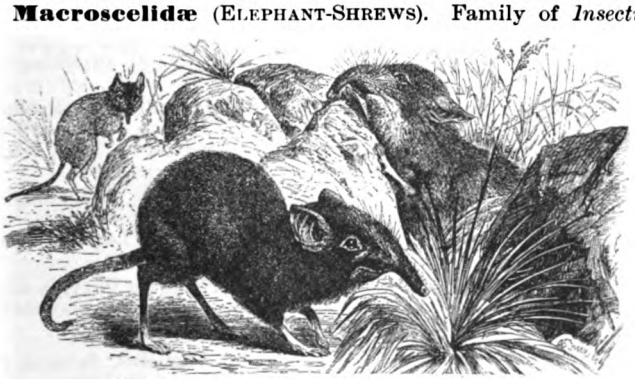
**Macrogonidium** (MEGAGAMETE). Larger of two cells that are to form a zygote.

**Macromeres.** Large spheres or cells resulting from the complete segmentation of an ovum which contains considerable yolk. They are usually transformed into hypoblast, and are relatively richer in yolk (deuteroplasm), in proportion to the protoplasm, than are the other cells.

**Macropetalichthys.** Ganoid fish whose large cranial plates constitute the most striking fish remains of the Corniferous limestone.

**Macropoda.** See POEPHAGA.

**Macroscelidæ** (ELEPHANT-SHREWS). Family of *Insectivora*, including small African shrews with long kangaroo-like hind legs, and an elongated snout like the proboscis of an elephant.



Elephant-muzzled Mouse (*Macroscelides typicus*).

**Macrosporangium.** Sporangium containing macrospores.

**Macrospores.** In Botany, larger spores of the heterosporous *Pteridophyta*, which develop into a prothallium bearing the archegonia or female organs of reproduction. See MEGASPORE.—In Biology, larger spores when two sizes are formed, the smaller being microspores.

**Macrosporophyll.** Leaf which bears a macrosporangium in the heterosporous *Pteridophyta*.

**Macrostylous.** Heterostylous flowers in which the style or styles are longer than the filaments.

**Macrotheriidæ.** See LORICATA (EDENTATA).

**Macrura,** or MACROURA. See DECAPODA.

**Mactridæ.** Family of Lamellibranchs, including forms with equivalved, trigonal shells, with two cardinal hinge teeth, a rounded pallial indentation, and fused siphons. *Mactra*, the large Beach Clam, is a familiar example.

**MacVeagh,** WAYNE, b. 1833. U. S. Minister to Turkey 1870–71, and to Italy 1894; Attorney-gen. 1881.

**McVicker,** JAMES HUBERT, 1822–1896. Theatrical manager in Chicago from 1857.

**MacWhirter,** JOHN, b. 1839. Scottish painter.

**Madagascar.** Island in the Indian Ocean, 250 m. from the African coast. Its length is 1,034 m., maximum breadth 360 m., area 230,000 sq. m. The interior is traversed by a range of high mountains. The lower country on either side is fertile, and much of it well cultivated. It was discovered by the Portuguese 1506. The Christian religion gained a footing under King Radama I. 1810–28, was placed under ban by his successor, and became the State religion 1868. The Hovas are the leading tribe. The inhabitants and their language are both called Malagasy. Antananarivo is the capital, Tamatave the principal seaport. The French claim a protectorate over M. by virtue of a treaty of Dec. 12, 1885, and conquered the Hovas 1895. Pop. ab. 3,500,000.

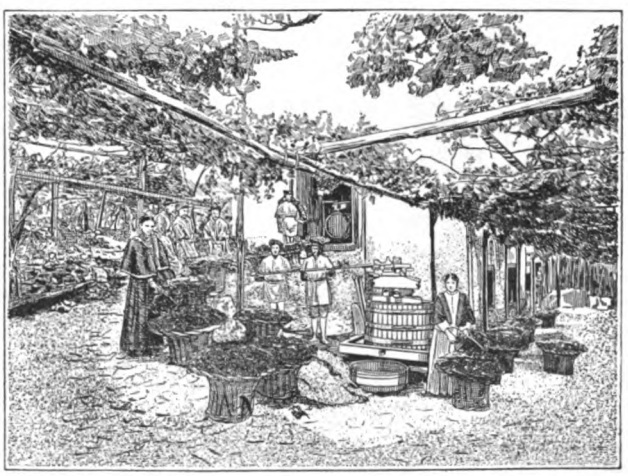
**Madden,** SIR FREDERICK, 1801–1873. Keeper of MSS. in British Museum; editor of many old documents; knighted 1832.

**Madden,** RICHARD ROBERT, M.D., 1798–1886. Irish historical writer.

**Madder.** *Rubia tinctoria.* Herb of the natural family *Rubiaceæ*, native of s. Europe and w Asia, cultivated for its roots, which furnish an important red dye. It is cultivated extensively in Holland for the root, also to some extent in the U. S. See ALIZARINE.

Madder (*Rubia tinctoria*).

**Madeira.** Island in the e. Atlantic, belonging to Portugal; in lat. 32° 40′ N., long. 17° W.; area 315 sq. m.; settled 1416; much visited for its climate, 64°–75° F. Chief town, Funchal. Pop., 1890, 132,668.



Peasants Pressing Grapes in a Vineyard at Madeira.

**Madeira.** Largest branch of the Amazon. It heads in the Andes near lat. 20° S., and flows n. and then n.e. to its mouth. Length ab. 2,000 m.

**Madeira Wines.** These wines were exported to England 1800–21 very largely, the production reaching 30,000 pipes. In 1852 the vines were attacked by a fungus, *oidium tuckeri*, which was exterminated by sulphur. In 1873 the vines were attacked by the *phylloxera*, which the American vine stocks, then introduced, resisted. There are three kinds of Madeiras, Boal, a rich wine, Sercal, a dry wine, and Malmsey or Malvoisie, a sweet wine. The first has 5 gns. tartaric acid per ounce. 20 gns. sugar and 19 per cent alcohol; the last has 10 gns. acid, 56 gns. sugar and 18.8 per cent alcohol.

**Maderno,** CARLO, 1556–1629. Italian architect, who lengthened the nave of St. Peter's at Rome.

**Madison.** Capital of Wisconsin, and of Dane co.; beautifully situated on an isthmus between two lakes of glacial origin; seat of the State University. Pop., 1890, 13,426.

**Madison,** JAMES, 1751–1836. Fourth Pres. U. S., 1809–17. He was active in Congress 1780–84, and in the Constitutional Convention 1787; M.C. 1789–97; author and defender of the Va. Resolutions of 1798; Sec. of State under Jefferson 1801–9, and his successor. His administration is memorable for the war with England.—His cousin, JAMES, D.D., 1749–1812, was Pres. of William and Mary Coll. from 1777, and Bp. of Va. 1790.

**Madison University.** See COLGATE UNIVERSITY.

**Mädler,** JOHANN HEINRICH VON, 1794–1874. Director of the Observatory at Dorpat, Russia, 1840–65. *History of Astronomy*, 1872.

**Madoc.** Welsh prince, said to have discovered a fertile continent to the west 1170, and sailed thither afterward with ten ships; hero of Southey's epic.

**Madonna.** Mother of Jesus, as subject of pictorial representation, abundant in all Christian ages.

**Madoz,** PASCUAL, 1806–1870. Spanish liberal, in the Cortes from 1836; Gov. of Barcelona 1854; Minister of Finance 1855. He edited a gazetteer, 10 vols., 1829–34, 20 vols. of *Causas Celebres*, and a Dict. of Spain, 16 vols., 1848–50.

**Madras.** City of s.e. India, on the Coromandel coast, in lat. 13°4′ N.; capital of a presidency; settled by the British 1639; taken by the French 1746 and 1758. It has a poor harbor, but an extensive commerce; a university, founded 1857, with affiliated colleges; and a valuable museum. Fort St. George was built 1750. Pop., 1891, 449,950.

Madrepora verrucosa.

A, surface view; B, longitudinal section of end of one branch of A showing 3 cups.

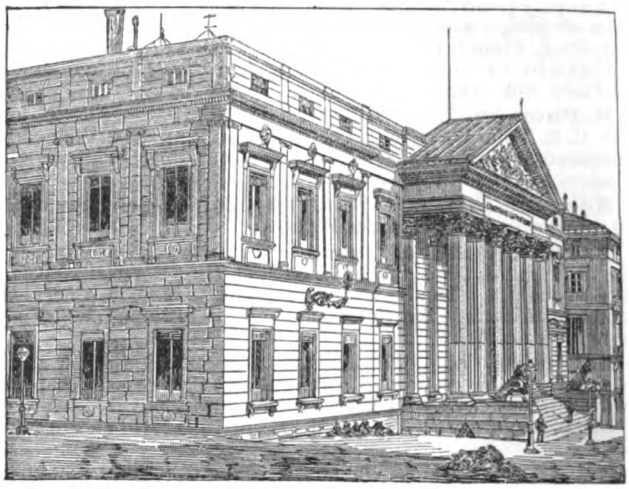
**Madrazo,** RAIMUNDO DE, 1841–1894. Spanish painter of the French school, b. in Italy.

**Madreporaria** (or SCLERODERMATA). Group of *Zoantharia*, including corals that secrete a continuous hard skeleton of lime. This is secreted by the outer lower surface of the individual polyps, in such a way as to form a mold of the internal structure so far as the number and development of the mesenterial septa go. The coral may be compact, as in the *Aporosa*, or porous, as in the *Perforata*, or porous in the base only, as in *Fungida*. In the first case synapticulæ are often present (*Oculina*, *Astræa*): in the second the visceral chamber is more or less open from top to bottom (*Inadreporidæ*): in the third, or mushroom corals, synapticulæ are present. Other forms having tabulæ have been placed into a group, TABULATA (q.v.), and some Palæozoic corals, with the septa not well developed, into TUBULOSA (q.v.). See CORALS.

**Madrepores.** Branched corals, whose thecæ are perforate or porous. The cavities communicate with a common axial canal in the branches. In solid forms, the type of growth is essentially the same as in branched forms. The growth being radial, the imagined branches may be conceived as fused to their extremities.

**Madreporite** (MADREPORIC PLATE or TUBERCLE). Porous plate, situated interradially in Echinoderms, as in star-fishes and sea urchins. It serves as a strainer and entrance for the water that enters the ambulacral water system.

**Madrid.** Capital of Spain, on the river Manzanares, near the center of the kingdom. It has several institutions of learning, and the arts and scientific societies, but little trade or


Palace of the Cortes, Madrid.

manufactures. It was taken from the Moors 939, held by Castile from 1085, and made the capital by Philip II. 1561; but its chief growth has been recent. The convents were suppressed 1836, and railways built 1850. Pop. ab. 500,000.

**Madrid Museum.** The Prado; one of the finest picture galleries of Europe, containing over 2,000 pictures, including 43 Titians, 25 by Veronese, 10 by Raphael, 62 by Velasquez, 64 by Rubens, and 46 by Murillo.

**Madrid,** PEACE OF. Jan. 14, 1528; exacted by Charles V. from his prisoner, Francis I., who consented to renounce all claims to Milan and Naples, and give up Flanders, Artois, and Burgundy. He repudiated it when free.

**Madrigal.** 1. Short poem, generally amorous in sentiment. 2. Its musical setting, polyphonic in style, but freer in dramatic expression than the contemporaneous church pieces. It grew up in Italy, and was most successfully cultivated by Palestrina, who pub. four books (two of them devoted to *Madrigali spirituali*), by Nanini, Amerio, and Marenzio. In England it endured longest, and its greatest masters were Morley, Weelkes (ab. 1600), Dowland (1562–1626), Byrd, and Wilbye. Madrigals are in three or more parts and without instrumental accompaniments.

**Madrona.** Trees of the genus *Arbutus*, natural family *Ericaceæ*, bearing showy white flowers and edible fruits, natives of N. America and Mexico.

**Madura.** Dutch island n.e. of Java, held by the Netherlands. Area ab. 1,750 sq. m.; pop. ab. 800,000, of Malayan stock.

**Madura.** Ancient town of s.e. India, capital of a British district, as long before of native princes. It has a large temple, built ab. 1650, and a Jesuit mission, founded 1606. Pop., 1891, 87,420.

**Madvig,** JOHAN NICOLAI, 1804–1886. Prof. Copenhagen 1829; in the Rigsdag from 1848 and often its pres.; editor of Livy and Cicero, and critic of classical texts. *Latin Grammar*, 1841; *Greek Syntax*, 1847.

**Mæander.** River in w. Asia Minor, rising in Phrygia and forming the boundary between Lydia and Caria; anciently noted for its tortuous course. Length ab. 350 m.

**Mæcenas,** ab. 70–8 B.C. Friend of Augustus, famous as the patron of Horace, Virgil, and other Roman authors.

**Maelström.** Dangerous current on coast of Norway, lat. 67° 48′ N., magnified by legend into a whirlpool.

**Maelzl,** JOHANN NEPOMUK, 1772–1838. German inventor of the panharmonicon, 1804, and the metronome, ab. 1815; in the U. S. from ab. 1821, exhibiting the automaton chess-player, the Burning of Moscow, the Rope-dancer, and other mechanical contrivances.

**Mænads.** Priestesses of Bacchus, whom they worshiped in frenzied dances.

**Mæotis,** PALUS. Sea of Azov.

**Maerlant,** JACOB VAN, 13th cent. Flemish author and translator. *Spiegēl Historiael.*

**Mæsa,** JULIA, d. 223. Grandmother of Elagabalus and Alexander Severus, whom she helped to the throne. She came

to Rome from Emesa in Syria with her daughters Soæmias and Mamia. Her coins are abundant in silver, but scarce in bronze.

**Maestricht.** Town of the Netherlands, on the Meuse or Maas; taken by the Normans 884, by the people of Liege 1408, by the Spaniards 1579, by the Dutch 1632, by the French 1673 and 1748; invested by the French 1793, by the Belgians 1830. Its fortifications were destroyed 1871–78. Its vast subterranean quarries are of remote date. Pop., 1890, 32,676.

West front of Notre Dame de Maestricht.

**Maeterlinck,** MAURICE, b. 1864. Belgian dramatist, hailed by some as a new Shakespeare. *Pelleas and Melisande*, 1892.

**Maffei,** ANDREA, 1802–1885. Italian poet, translator of Schiller, Goethe, and Milton.

**Maffei,** FRANCESCO SCIPIONE, MARCHESE DI, 1675–1755. Italian dramatist, antiquarian, and theologian. His tragedy, *Merope*, 1713, was highly valued. *Verona Illustrated*, 1732; *Antiquities of Gaul*, 1733; *Grace, Free Will, and Predestination*, 1742. *Works*, 21 vols., 1790.

**Maffia.** Powerful and lawless secret organization in Sicily, with branches in the U. S. Some of its members in New Orleans, believed to have murdered the chief of police, were lynched 1890, which caused international complications. The Italian government has failed to suppress the society at home.

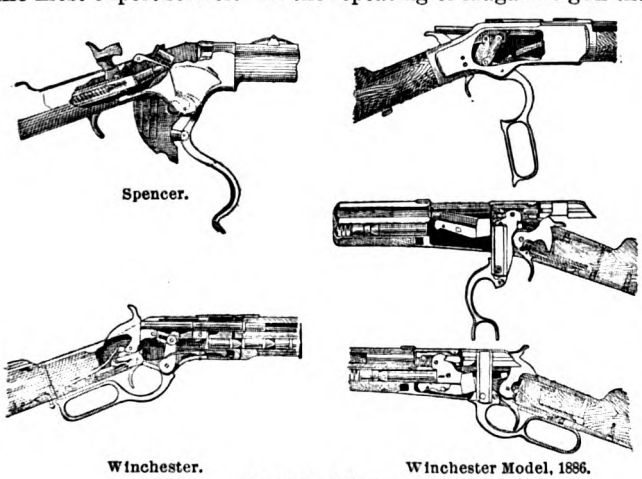
**Magalhaes,** BENJAMIN CONSTANT BOTELHO DE, 1838–1891. Brazilian statesman, active in founding the republic.

**Magalhaes,** DOMINGO JOSÉ GONZALVES DE, 1811–1882. Brazilian poet and diplomatist.

**Magalhaes,** FERNAO, ab. 1470–1521. Portuguese sailor, discoverer of the Strait of Magellan 1520.

**Magazine.** Structure for storage of powder and projectiles for service of a battery of guns. A field magazine is usually constructed of logs with a covering of earth, so that it will be near its battery, easy of access, commodious, well drained and ventilated. It must be bomb-proof and have sufficient thickness of earth to withstand the penetration of projectiles. In permanent works the main magazine is located in the most secure position possible, for on its security depends the defensive character of the work.

**Magazine Gun.** In the ordinary breech-loading rifled musket, the operations of opening the breech, inserting the cartridge, and closing the breech, require a definite time with the most expert soldier. In the repeating or magazine gun the



Spencer.

Winchester. Winchester Model, 1886.

Magazine Rifles.

time required to take the cartridge from the box or belt and insert it in the gun is dispensed with by an automatic movement, leaving only the opening and closing of the breech for the soldier. But as the magazine is limited (generally to 5 cartridges), these are to be considered as a reserve, to be used only in emergency, and ordinarily the gun is to be used as a single loader. The principal magazine guns now used in the various services are the Mauser, Mannlicher, Lee-Metford, Lebel, and Krug-Jorgensen. The latter, caliber .303 in., has been adopted in the U. S. service.

**Magdala.** Fortress of Abyssinia, capital of Theodore II.; stormed and taken by Lord Napier, April 13, 1868; burned April 17.

**Magdala Red.** $C_{30}H_{21}N_4Cl$. Pink dye, prepared by heating $\alpha$-amidoazonaphthalene with $\alpha$-naphthylamine; dark brown powder, soluble in water with difficulty. It dyes silk pink.

**Magdalen,** MARY. Devoted adherent of Jesus, who had delivered her from demoniac possession; popularly supposed, without warrant, to have been a woman of evil life.

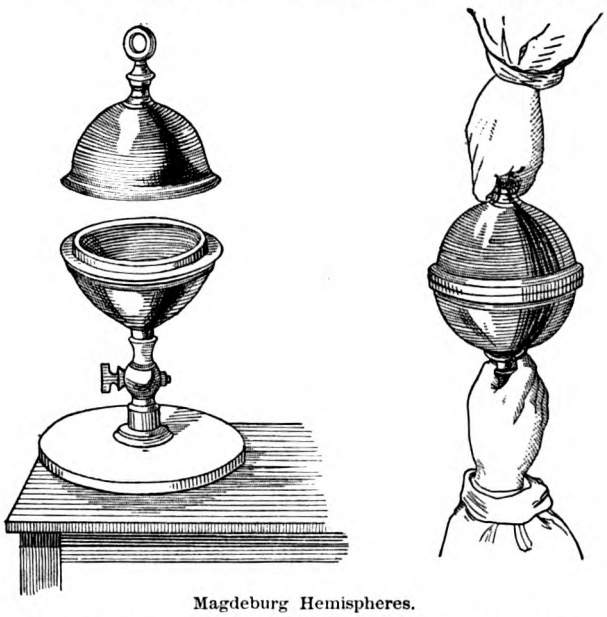
**Magdalen,** ORDER OF. Various associations, from ab. 1000 or earlier, for the rescue of the fallen.

**Magdalena.** River of Colombia, flowing n. into the Caribbean Sea. Length 1,050 m.; drainage area ab. 93,000 sq. m.

**Magdalen Islands.** In the Gulf of St. Lawrence, 60 m. w. of Newfoundland. Area 156 sq. m.; pop. ab. 4,000.

**Magdeburg.** Capital of Prussian-Saxony, on the Elbe; founded 805 and again 924; strongly fortified; besieged by Maurice of Saxony 1550, and by Wallenstein 1629; taken by Tilly 1631 and destroyed, with most of its citizens; taken from Prussia by Napoleon 1803–14. It has an extensive commerce and some manufactures. Pop., 1890, 202,234.

**Magdeburg Hemispheres.** Apparatus for demonstrating the pressure of the air. Experiment was first performed by Otto von Guericke, Burgomaster of Magdeburg ab. 1650. If two hollow hemispheres be nicely fitted at the edges and the



Magdeburg Hemispheres.

air exhausted by an air-pump, the pressure of the air on the outside of the globe will be more than one kilogram for each sq. centimeter of cross sectional area. The parts are usually furnished with handles for pulling them apart. See GUERICKE, OTTO VON.

**Magee,** WILLIAM, D.D., 1765–1831. Dean of Cork 1813, Bp. of Raphoe 1819, Abp. of Dublin 1822. His *Doctrine of Atonement*, 1801, was long valued by the Evangelical school.

**Magee,** WILLIAM CONNOR, D.D., LL.D., 1821–1891. Dean of Cork 1864, Bp. of Peterborough 1868, Abp. of York 1891; notable for eloquence and activity.

**Magellan.** See MAGALHAES.

**Magellan,** STRAIT OF. Narrow tortuous passage through the islands at s. end of S. America, separating Tierra del Fuego from the mainland.

**Magendie,** FRANÇOIS, 1783–1855. Prof. of Anatomy in Coll. de France 1831; writer on physiology, and investigator, using vivisection freely.

**Magenta.** See FUCHSINE.

**Magenta.** Town of Lombardy; near which 55,000 French and Sardinians under MacMahon defeated 75,000 Austrians, June 4, 1859. The latter lost 10,000 killed and wounded, and 7,000 prisoners.

**Maggini,** GIOVANNI PAOLO, d. 1640. Violin maker at Brescia, supposed pupil of Gaspar da Salo.

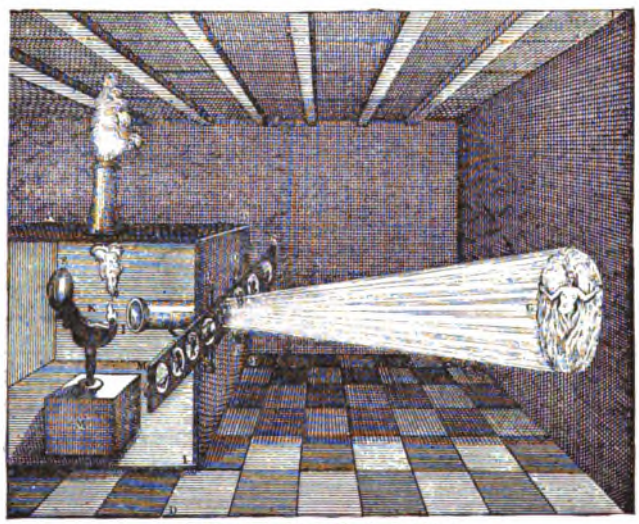
**Maggiore.** Italian-Swiss lake, 39 m. long; expansion of the Ticino.

**Maggot.** Larva of *Diptera* and *Hymenoptera;* once thought to be bred spontaneously in putrefying flesh. Redi proved ab. 1638 that they always developed from eggs laid by flies.

**Magi.** Oriental sages, probably Persian priests, who came to render homage to the infant Saviour.

**Magic.** With primitive man the belief is very general that nothing can be accomplished without the aid of supernatural powers. The means employed for controlling these powers and invoking their assistance, and for determining by their aid events past and to come, are commonly designated as magical, the term magic being applied to the mass of beliefs and practices. Everywhere we find a class of persons who claim special familiarity with such arts, the word itself being derived from the Persian magi, an hereditary class of priests, the tradition of whose skill has left a deep impress upon the language and literature of classical nations. Among some of the American tribes, the belief was entertained that not only the fertility of the soil and the reproductive powers of nature depended upon magical rites, but that even the existence of the world itself was bound up in their performance. The mask, the rattle, the drum and staff, were among the appliances used in these ceremonies, which comprised dramatic dances and the recitation of magical formulæ.

**Magic Lantern.** Instrument for projecting upon a screen magnified images of transparent pictures, either paintings or photographs on glass slides. It has one lens or set of lens, called the condenser, for converging a beam of light on the slide, and another, the object glass, for forming an image of



Father Kircher's Magic Lantern
(From an Engraving of the Seventeenth Century).

the slide on the screen. The electric light is often used as the source of illumination: the instrument may then be called a photo-electric lantern. A modified form of this instrument for forming upon a screen images of opaque objects is called a megascope. The object is very brilliantly illuminated and placed in one of the conjugate foci of a double convex lens, the screen being in the other focus.

**Magic Mirrors.** Mirrors were anciently cast from bronze in China. On the backs they were decorated with reliefs representing mythological personages, birds, flowers, weapons, and pithy expressions. They are generally circular in form, and coated with an amalgam consisting of two parts tin and one part quicksilver. Some of them, when they reflect the sunlight on the wall, show more or less distinctly the figures on their backs. This is due to the unevenness of the convex arching which the reflecting surface receives in polishing, in consequence of uneven pressure from the back.

**Magic Square.** One in which the numbered cells add up the same amount; said to have been used by the Egyptians and Pythagoreans to impose on the credulous. They are much used as talismans in Mohammedan countries, and are known to the Chinese, one of whose most ancient magical diagrams is a square, the sum of which each way is fifteen.

**Maginn,** WILLIAM, LL.D., 1793–1842. Irish essayist. *Homeric Ballads*, 1849; *Miscellanies*, 5 vols., 1855–57.

**Magistral.** Directrix or master-line used to mark out the trace of a permanent fortification; so called because all lines of the trace are dependent upon it for their position. In temporary works, the projection of the line of the interior crest is the directing line.

**Magliabecchi,** ANTONIO, 1633–1714. Librarian at Florence, where his large collections remain.

**Magna Charta.** Charter of English liberty; extorted by the barons from King John, 1215, and confirmed by many later monarchs.

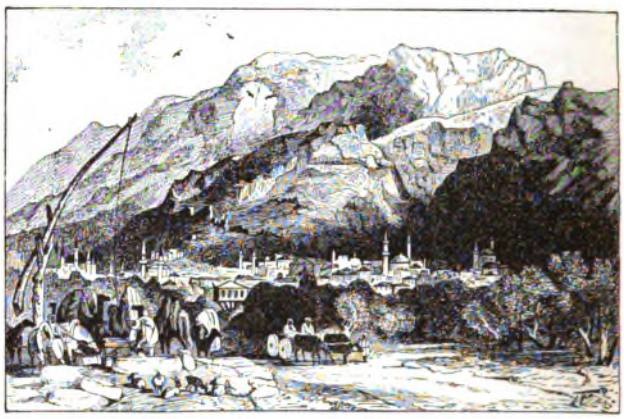
**Magna Græcia.** S. Italy, as anciently covered with Greek colonies. See GRÆCIA, MAGNA.

**Magnan,** VALENTIN, b. 1835. French neurologist. *Alcoholism*, 1874.

**Magnanimity.** Disposition which leads one to disregard small dangers, injuries, and offenses.

**Magne,** PIERRE, 1806–1879. French Minister of Public Works 1851, and of Finance 1855–63, 1867–69, and 1873–74.

**Magnesia.** 1. City of Lydia, near Mt. Sipylus; now Manissa. Here the Scipios defeated Antiochus of Syria 190 B.C.



Magnesia, in Lydia.

2. City n. of the Mæander, noted for its temple of Artemis.
3. E. district of Thessaly.

**Magnesia.** See MAGNESIUM OXIDE.

**Magnesia Alba.** See MAGNESIUM CARBONATE.

**Magnesia Usta.** See MAGNESIUM OXIDE.

**Magnesite.** $MgCO_3$. Natural magnesium carbonate, not very common as a mineral, usually occurring in association with magnesian rocks. It has found use as a refractory material for linings for the converters used in the basic Bessemer process for making steel.

**Magnesium.** Mg. At. wt. 24.3, sp. ht. .249, valence II. First isolated by Davy 1808. Silver-white metal; sp. gr. 1.72, mpt. 550° C., bpt. over 1,100° C.; it takes fire at a red-heat and produces an intense white light; burning at the rate of 2 gns. per minute, the light is equal to 70 candles. It occurs in large quantities in nature, in magnesite, dolomite, serpentine, soapstone, meerschaum, etc. It is very ductile, and can be made into wire or ribbon; decomposes water at 100°, is but slowly acted upon by the air, and dissolves easily in the dilute acids, but not in alkalies.

**Magnesium,** METALLURGY OF. It is very difficult to extract from its combinations. Davy first obtained the metal, decomposing the chloride by electrolysis in 1808. It was isolated by Bussy 1849, by acting on magnesium chloride with potassium. Three years later, Bunsen decomposed fused magnesium chloride by an electric current, opening up a new way of obtaining this and similar metals. It is now obtained by a similar process at Hemelingen. The carnallite from Stassfurt is melted in iron pots, which serve as the negative pole of the apparatus, while a carbon rod serves as anode. The chlorine evolved at the anode is carried away by a tube surrounding it, and utilized; the magnesium collects on the sides of the pot, rises to the surface, and is skimmed off by perforated ladles. The metal is kept from burning by reducing gases led in under the cover. The principal uses are for flashlight photography and in pyrotechnics.

**Magnesium Ammonium Phosphate.** $MgNH_4PO_4 + 6H_2O$. Insoluble crystalline salt, obtained by adding sodium phosphate and ammonia to a magnesium salt; this reaction serves as a test for magnesium. It is found in guano and decomposing urine.

**Magnesium Bromides.** $MgBr_2$. White crystalline substance; found in small quantities in sea water and Stassfurt mines. Made by passing bromine vapors over a heated mixture of magnesium oxide and carbon.—$MgBr_2 + 6H_2O$. Obtained by

careful concentration of a solution of magnesium oxide in hydrobromic acid.

**Magnesium Calcium Carbonate.** See DOLOMITE.

**Magnesium Carbonate.** $MgCO_3$. Occurring in nature as MAGNESITE (q.v.); white, insoluble powder, of varying composition. If sodium carbonate be added to magnesium sulphate, the resulting compound has the formula $Mg(OH)_2.2MgCO_3$. If this be dried at a low temperature, Magnesia alba, $Mg(OH)_2.4MgCO_3+4H_2O$, employed in medicine, is formed.

**Magnesium Chlorate.** $Mg(ClO_3)_2+6H_2O$. Leaf-like crystals, decomposing at 120° C., into oxygen, chlorine, and magnesium oxide; made by bringing magnesium sulphate and barium chlorate together in solution.

**Magnesium Chloride.** $MgCl_2$. Occurring in nature; white crystalline mass, very soluble and deliquescent, made by dissolving magnesium carbonate in hydrochloric acid or by gently heating ammonium magnesium chloride. From concentrated solutions it crystallizes with six molecules of water.

**Magnesium Fluoride.** $MgF_2$. White, amorphous, tasteless powder, obtained by treating magnesium carbonate with hydrofluoric acid. It occurs in nature as SELLAITE (q.v.).

**Magnesium Hydroxide.** $Mg(OH)_2$. Gelatinous mass, precipitated by adding a hydroxide to a magnesium salt; dried at 100°, it forms a white insoluble powder. It is soluble in ammonium salts, forming double salts.

**Magnesium Iodide.** $MgI_2$. Deliquescent crystals, obtained by dissolving magnesium oxide in hydriodic acid and evaporating the solution.

**Magnesium Light.** See MAGNESIUM.

**Magnesium Nitrate.** $Mg(NO_3)_2+6H_2O$. Rhombic columns or needles, or triclinic crystals, obtained by dissolving magnesium oxide or carbonate in nitric acid.

**Magnesium Nitride.** $Mg_3N_2$. Greenish yellow, amorphous powder, which burns in oxygen; made by heating magnesium in nitrogen or ammonia.

**Magnesium Nitrite.** $Mg(NO_2)_2+2H_2O$. Leaf-like substance, obtained on boiling silver nitrite with magnesium oxide.

**Magnesium Oxide,** or MAGNESIA. MgO. White, loose powder, almost insoluble in water; made by igniting the hydroxide or carbonate. A fine variety, magnesium usta, is made by heating the basic carbonate. It is used in medicine as an application to wounds, and, when mixed with ferric sulphate, as an antidote for arsenic poison, also for the manufacture of cements and fire-brick.

**Magnesium Perchlorate.** $Mg(ClO_4)_2$. Long columns, soluble in alcohol; made by treating magnesium oxide with perchloric acid.

**Magnesium Phosphates.** Two are known, secondary magnesium phosphate, $MgHPO_4$, and the tertiary phosphate, $Mg_3(PO_4)_2$. See MAGNESIUM AMMONIUM PHOSPHATE.

**Magnesium Potassium Chloride.** $MgCl_2.KCl+6H_2O$. Made by bringing together in solution magnesium and potassium chlorides in molecular proportions. It occurs in sea-water, and as CARNALLITE (q.v.).

**Magnesium Potassium Sulphate.** See SELIONITE.

**Magnesium Pyrophosphate.** $Mg_2P_2O_7$. Crystalline or amorphous powder, obtained by heating magnesium ammonium phosphate. Precipitated from solution, it contains $3H_2O$.

**Magnesium Silicates.** OLIVINE, SERPENTINE, TALC, MEERSCHAUM, ASBESTOS, and SOAPSTONE (q.v.).

**Magnesium Sulphate.** $MgSO_4+7H_2O$. It occurs in nature as kieserite; it is used in medicine, in the manufacture of sodium and potassium sulphates, as a fertilizer, and for loading cotton fabrics. See EPSOM SALT.

**Magnesium Sulphide.** MgS. Yellowish-gray, porous, microscopic crystals, obtained by passing sulphur vapors over heated magnesium. It decomposes in moist air and in water with the evolution of hydrogen sulphide. Higher sulphides are known.

**Magnesium Sulphite.** $MgSO_3+6H_2O$. Hexagonal crystals, which in the air are slowly converted into the sulphate; made by passing sulphur dioxide into water containing magnesium carbonate in suspension, and evaporating the solution. Dissolved in sulphurous acid, it is used in decolorizing sugar.

**Magnet.** See MAGNETISM.

**Magnetic Declination.** See DECLINATION OF THE NEEDLE.

**Magnetic Elements** OF A PLACE ON THE EARTH'S SURFACE. Declination, Inclination or Dip, and intensity of the earth's magnetism. They all vary from place to place and from time to time.

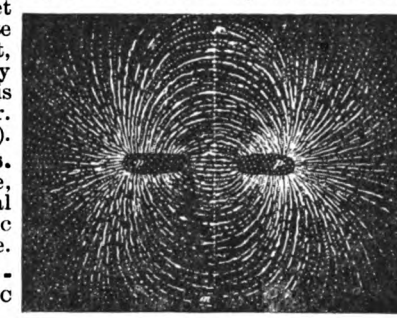
**Magnetic Meridian.** Plane containing the magnetic poles of the earth and the axis of a freely suspended magnet. In general it does not coincide with the geographical meridian, nor is its position with reference to the latter constant.

**Magnetic Moment.** Equal to the product of the numerical strength of either pole by the distance between the poles. It is equal to the moment of the couple which acts on the magnet when freely suspended in a field of unit intensity, perpendicular to the lines of force.

**Magnetic Oxide of Iron.** See MAGNETITE and FERROSO-FERRIC OXIDE.

**Magnetic Permeability.** See COEFFICIENT OF MAGNETIC INDUCTION.

**Magnetic Phantom,** or SPECTRUM. By means of iron filings sifted on a sheet of paper or glass-plate placed over a magnet, the field in the vicinity may be studied. This was first done by Dr. Wm. Gilbert (1540–1603).



Magnetic Phantom.

**MagneticPyrites.** $Fe_7S_8$. Iron sulphide, occurring as a mineral with feeble magnetic properties; pyrrhotite.

**Magnetic Spectrum.** See MAGNETIC PHANTOM.

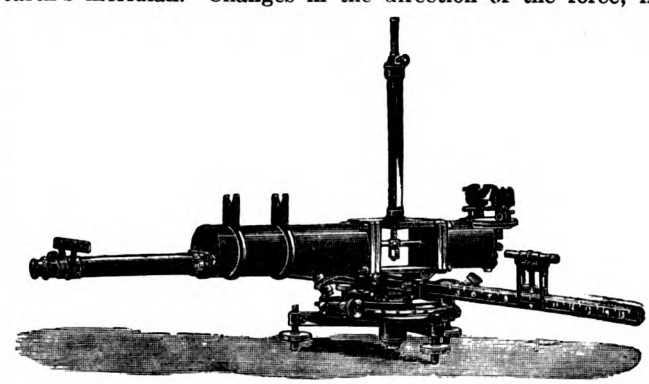
**Magnetism.** That property of certain substances, notably of iron, nickel, and cobalt, in virtue of which they attract iron. Magnets may be natural, as in the case of the magnetic ore or lodestone; or artificial, as a piece of hard steel which has been magnetized. If a piece of soft iron be surrounded by a coil of insulated wire, and an electric current be passed through the wire, the iron becomes a magnet, and the whole is called an electro-magnet. The strength of a magnet is found to be greatest near the ends or poles. When freely suspended, a magnet sets itself nearly n. and s. All bodies belong to one of two classes, according as they set themselves axially or equatorially when suspended in a magnetic field of force; when axially, they are paramagnetic, ferromagnetic, or simply magnetic; *e.g.*, iron, nickel, cobalt; when equatorially, they are diamagnetic; *e.g.*, bismuth, antimony, zinc.

**Magnetite,** or MAGNETIC IRON ORE. $FeO.Fe_2O_3$. Natural compound of the ferrous and ferric oxides of iron, strongly attracted by the magnet. When pure it contains 72.4 per cent of iron. It occurs abundantly in beds and masses in the older geological formations, and is an important ore of iron. It is distinguishable from other ores of iron by its black powder, and by its crystalline form, which is usually octahedral or dodecahedral.

**Magneto-Electric Machine.** See DYNAMO ELECTRIC MACHINE.

**Magnetograph.** See MAGNETOMETER.

**Magnetometer.** Instrument for measuring the intensity of a magnetic field. A simple form for detecting slight changes in the strength of the earth's magnetism consists of a bar magnet hung with a bifilar suspension, so turned that the bar is at rest in a position as nearly as possible perpendicular to the earth's meridian. Changes in the direction of the force, if



Unifilar Magnetometer, Kew Model.

they be not over a few minutes of arc, will have no appreciable effect on the magnet, but a slight change of intensity will produce a corresponding change in its position of equilibrium. If the apparatus be so arranged as to produce a permanent record

of the changes it indicates, it is called a magnetograph. Such a record may be made by reflecting a beam of light from the polished end of the magnet upon a sheet of photographic paper moved by clockwork.

**Magneto-Optic Rotation.** Phenomenon observed by Dr. Kerr, who obtained a rotation of the plane of polarization of a beam of light by reflecting it from the polished surface of an electro-magnet.

**Magneto-Rotatory Polarization.** Phenomenon observed by Faraday, consisting in the fact that the plane of polarization of a beam of light is rotated by passing it through a transparent medium in a strong magnetic field. The amount of rotation is dependent upon the strength of the field and the nature of the medium.

**Magnificat.** Hymn of the Virgin. Luke i. 46–55; used by R. C., Eastern, Anglican, and P. E. Churches. Till the 16th century it was probably sung antiphonally, like the *Te Deum*. When harmony began to be developed in France, it was customary to sing the verses alternately to the primitive plan chant and the artificial form called *faux bourdon*, in which the tenor voice sang the psalm tone while the harmony voices accompanied it in parallel thirds and sixths. Later composers set the canticle in the oratorio style, employing solo voices, full choir and orchestra. A striking example of this kind is Bach's *Magnificat in D.*

**Magnifying Power.** See MICROSCOPE.

**Magnifying Power of Telescope.** Equal to the focal length of the object glass divided by the focal length of the eyepiece. A power of 75 to each inch of aperture of the object glass is about the maximum which can be used with advantage.

**Magnin,** CHARLES, 1793–1862. French poet, dramatist, and critic. *Racine*, 1826; *Origins of the Modern Theater*, 1838; *Hist. Marionettes*, 1852.

**Magnitude of a Star.** Measure of a star's brightness, the brightest being of the first magnitude, those just visible to the naked eye of the sixth: the scale is carried down to the eighteenth for telescopic stars. Three fixed stars are brighter than the first magnitude: this is indicated by assigning a negative magnitude. Thus the magnitude of Sirius is —1.4.

**Magnol,** PIERRE, 1638–1715. Prof. and Director of Botanical Gardens, Montpelier. *Botanicum Monspelliense*, 1686; *Prodromus historiæ generalis plantarum*, 1689; *Novus character plantarum*, 1720.

**Magnolia.** Genus of showy-flowered trees and shrubs, natural family *Magnoliaceæ*, natives of Asia and the e. U. S.

Magnolia grandiflora.

**Magnoliaceæ.** Natural family of flowering plants, of the class *Angiospermæ*, and sub-class *Dicotyledons*, comprising ab. 14 genera and 100 species of trees and shrubs, of wide distribution in temperate and tropical regions; called the Magnolia family.

**Magnus,** OLAUS, 1490–1558. Swedish historian. *Northern Nations*, 1555.

**Magnusen,** FINN, 1781–1847. Icelandic scholar, prof. Copenhagen 1815; ed. elder *Edda*, 4 vols., 1824–26.

**Magnus' Salt.** $PtCl_2.2NH_3$. Discovered 1829; made by adding ammonia to a boiling solution of platinous chloride in hydrochloric acid; insoluble in water and hydrochloric acid.

**Magnusson,** ARNI, 1663–1730. Icelandic antiquarian, prof. Copenhagen 1701.

**Magog.** In Ezekiel, name of a people from the North who were to devastate Israel; image of destructive barbarism, then found chiefly in Scythia, from which terrible swarms occasionally desolated w. Asia.

**Magosphæra Planula.** Spherical and ciliated colony of *Protozoa*. All the cells meet pyramidally in the center. At times the colony breaks up, the separate bions become amœboid, and each ultimately, by cell division, forms a new colony. See CATALLACTA and MEZOZOA.

**Magpies.** Birds of the Crow family, found in both hemispheres. The middle tail feathers are longest. *Pica caudata*, the common European species, is iridescent black, with white shoulders and inner webs of flight feathers. Length 18 in. They can be taught to talk.

**Magruder,** JULIA, b. 1851. American novelist. *Across the Chasm*, 1885; *At Anchor*, 1887.—Her uncle, JOHN BANKHEAD, 1810–1871, was a U. S. officer 1830–61, and Major-gen. C.S.A. 1862–65.

**Maguire,** JOHN FRANCIS, 1815–1872. Irish journalist and author, M.P. from 1852. *Rome and Its Ruler*, 1857–70.

**Magyar Language.** See HUNGARIAN.

**Magyars.** Mongolians from the Ural region, who entered Europe and invaded what is now Hungary 889. They are related to the Finns and Lapps. They have retained their Turanian language, but contact with neighboring races has greatly modified their civilization. They belong to the Greek and Latin branches of Christianity, and have made great progress in the arts, education, sciences, and literature. Ab. 40 per cent of the inhabitants of Hungary are Magyars. See HUNS and HUNGARY.

Magyar Costumes.

**Māhā-bhārata.** Great epic poem of the Hindus, probably the longest in the world, containing ab. 220,000 lines. Attributed to a divine source, and to Krishna Dwaipāyana. Its date is thought to be ab. 500 B.C. The leading subject is the war between the Kauravas and Pāndavas.

**Mahaffy,** JOHN PENTLAND, D.D., b. 1839. Prof. Dublin 1869. *Social Life in Greece*, 1874; *Hist. Greek Literature*, 3 vols., 1880; *Greek Life and Thought*, 1887.

**Mahan,** ALFRED THAYER, U.S.N., LL.D., D.C.L., b. 1840. Son of Prof. Dennis H.; pres. U. S. Naval War College at Newport 1886–89 and 1890–93; resigned 1896. His *Influence of Sea Power upon History*, 1890, has won much praise in Europe. *Life of Farragut*, 1892.

**Mahan,** ASA, D.D., LL.D., 1800–1889. Pres. Oberlin Coll., O., 1835–50, Cleveland Univ., Mich., 1850–56, and Adrian Coll., Mich., 1860–71. *Intellectual Philosophy*, 1845–82; *Moral Philos.*, 1848; *Theism*, 1872; *Spiritualism*, 1876; *Hist. Philosophy*, 1883.

**Mahan,** DENNIS HART, U.S.A., LL.D., 1802–1871. Prof. of Engineering at West Point from 1832. *Field Fortifications*, 1836; *Civil Engineering*, 1837–68; *Industrial Drawing*, 1853.—His brother, MILO, D.D., 1819–1870, prof. General Theol. Sem., New York, 1857–64, pub. *Hist. Ch.*, 1860–72. *Works*, 1872–75.

**Mahanadi.** River of India, flowing e. into the Bay of Bengal. Length 520 m., drainage area 43,800 sq. m.

**Mahanoy City.** Mining town of Schuylkill co., Pa. Pop., 1890, 11,286.

**Mahavansa.** History of Ceylon, in Pali, extending to 302.

**Mahavira.** Hero or saint of the Jains.

**Mahayana.** Speculative doctrine of a Buddhist school, opposed to the Hinayana.

**Mahdi.** Mohammedan Messiah, expected to complete the work of Mohammed and make things ready for the Last Judgment; character assumed 1881 in the Egyptian Sudan, by the Arab Achmed Suleiman, 1842–1885, whose victorious career resulted in the destruction of Hicks Pasha's army 1883, the capture of Khartum and death of Gordon 1885.

**Mahmud I.,** 1696–1754. Sultan of Turkey from 1730.

**Mahmud II.,** 1785–1839. Son of Abdul Hamed; sultan from 1808. He effected many reforms, rid Turkey of the Janizaries, and reorganized the army after European models, but lost Greece, and hardly retained Egypt.

**Mahmud,** 971–1030. Founder of the Ghaznevi dynasty; Gov. of Khorassan 994. He overthrew his brother Ismail 996, took Ghazni 997, aided in the overthrow of the Persian kingdom, founded an empire in Central Asia, and made numerous expeditions into India 1000–29, and assumed the title Sultán.

**Mahogany.** Wood of *Swietenia mahogoni*, growing in the West Indies and Central America. It is of a reddish color, extremely hard, strong and heavy. Australia and other countries furnish spurious though often valuable mahoganies. The mountain mahogany of Utah is *Cercocarpus ledifolius*. The better sorts are called Spanish mahogany.

**Mahomet.** See MOHAMMED.

**Mahometan Architecture.** See SARACENIC ARCHITECTURE.

**Mahon,** LORD. See STANHOPE.

**Mahone,** WILLIAM, 1826–1895. Col. C.S.A. 1861, Major-gen. 1864; Republican and Readjuster leader in Va.; U. S. Senator 1881–87.

**Mahony,** FRANCIS ("FATHER PROUT"), 1805–1866. Irish humorist. *Facts and Figures from Italy*, 1847; *Reliques*, 1837–75; *Works*, 1880. His best known poem is *The Bells of Shandon*.

**Mahopac,** LAKE. Summer resort, 51 m. n.e. of New York, in Putnam co., N. Y., at an elevation of 1,800 ft.

**Mahrattas.** People of w. India, who from ab. 1660 made large conquests, and warred with the British till 1843. Nothing is known of their early history, or geographical or ethnological

Mahrattas.

origin, but judging from their physical characteristics, religion, and language, it is supposed they came from Central Asia.

**Mai,** ANGELO, 1782–1854. Italian Jesuit, librarian at the Vatican 1819, cardinal 1838; discoverer of sundry classical texts. His editions of ancient MSS. fill 36 vols., 1825–53.

**Maia.** Daughter of Atlas; eldest of the Pleiades; mother of Hermes, by Zeus.

**Maiden.** Prototype of the guillotine, once used in Scotland and n. England.

**Maidenhair.** *Adiantum pedatum.* Delicate woodland fern, native of e. N. America; also other species of the same genus.

**Maidenhair Tree.** See GINKO.

**Maid Marian.** The story of Maid Marian has been considered a dramatic fiction, and the character borrowed from a French pastoral drama of the 11th century, entitled *Le jeu du Berger, et la Bergerie.* On the other hand it is declared that the name was originally assumed by a lady of high degree who was murdered at Dunmow Priory, where her tomb may still be seen. She is reputed to have married Robin Hood, the outlawed Earl of Huntington, and after his death to have been murdered by means of a poisoned bracelet, sent her by King John.

**Maidment,** JAMES, 1794–1879. Anglo-Scottish lawyer and antiquary, editor of ballads, 1824–59, and of *Dramatists of the Restoration*, 1872–75.

**Maid of Kent.** ELIZABETH BARTON (q.v.), whose prophecies deceived many; executed 1534.

**Maid of Norway,** 1282–1317. Margaret, Queen of Scotland 1286–90; b. in Norway.

**Maid of Orleans.** See JOAN OF ARC.

**Maids of Honor.** Immediate attendants to the Queen, 8 in number. See HOUSEHOLD, ROYAL.

**Maikoff,** APOLLON NIKOLAEVICH, b. 1821. Russian poet and dramatist.—His brother, LEONTI, b. 1839, is a journalist of note; his great-grandfather, VASILI, d. 1778, wrote tragedies and lyrics.

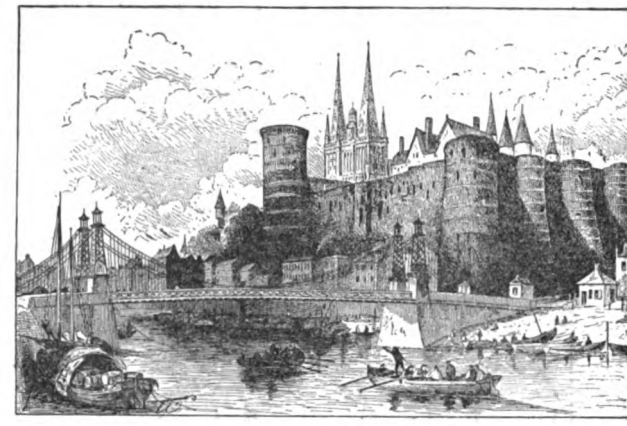
**Maildun.** Irish wonder-tale of the sea; written perhaps ab. 750, tr. 1879; one of the four *Imrama* or marine legends.

**Maimbourg,** LOUIS, 1610–1686. French Jesuit, author of sundry partisan histories.

**Maimon,** SOLOMON, 1754–1800. Jewish philosopher of wandering life; b. in Russia; esteemed by Kant and Moses Mendelssohn. *Transcendentalphilosophie*, 1790.

**Maimonides,** 1135–1204. Arabian philosopher, mathematician, and astronomer, one of the ablest of the Hebrew race; b. at Cordova; resident at Cairo from ab. 1170. His most important works are *Mishna Thorah*, 1180, and *Delalath al-Hairin*, or *Guide of the Perplexed*, 1190, tr. 1886. They have exerted great influence.

**Main.** German river, rising in Bavaria and flowing w. to



Angers on the Main.

its confluence with the Rhine near Mainz; navigable for 205 m. Length, 307 m.

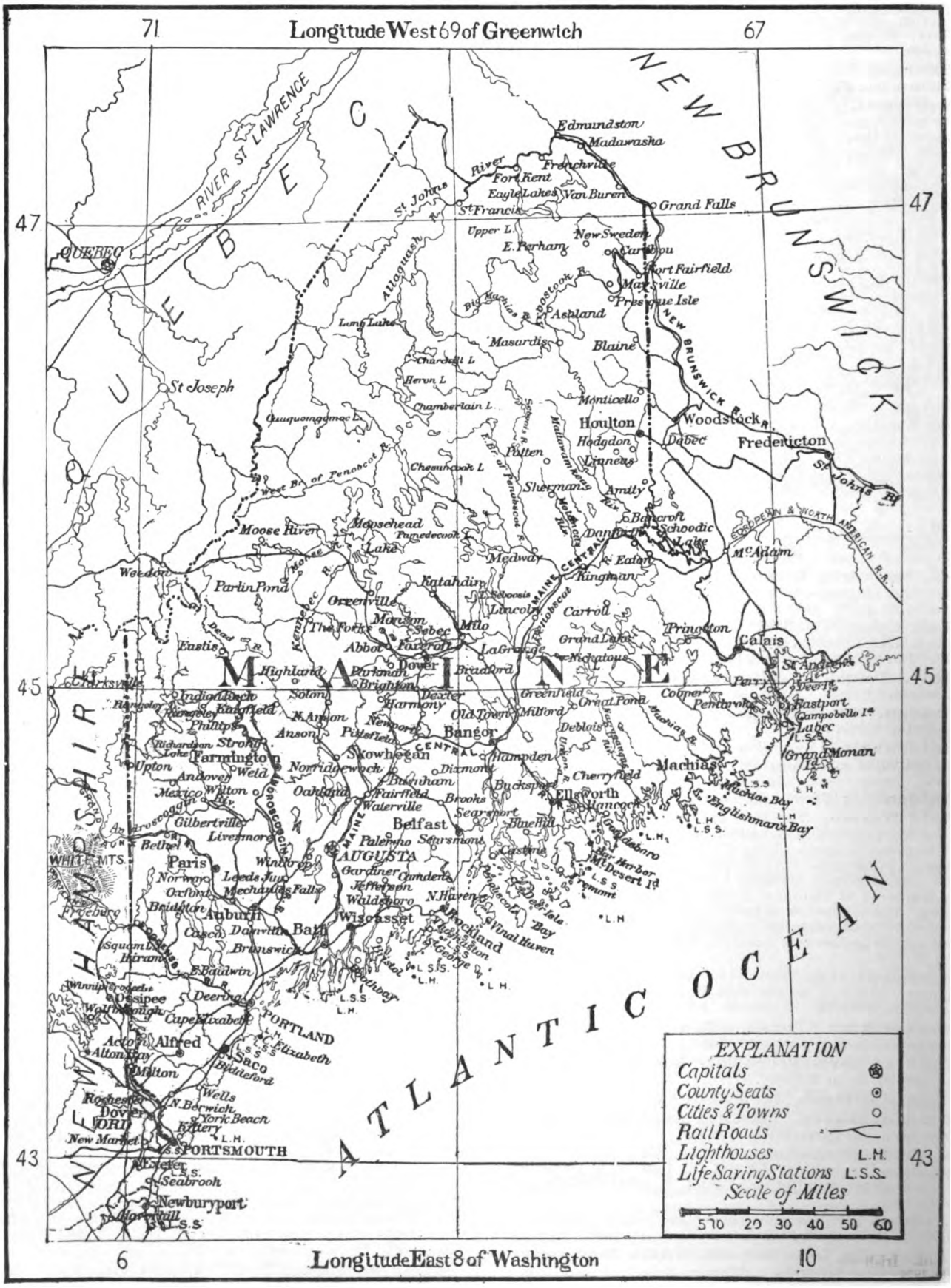
**Maine.** Former province of France, s. of Normandy.

**Maine.** Northeasternmost of the U. S. Its area is 33,040 sq. m. The coast is rugged and extremely irregular, with islands and deep land-locked bays and passages. The surface near the seacoast is hilly, rising n. and becoming mountainous in parts. It abounds in lakes and streams, several, as the Penobscot and Kennebec, are navigable for considerable distances from the coast. The State was originally covered with dense forests. In the settled portions these have been largely cut away. Geologically, M. is one of the oldest of the States. Most of its area, including all of the s. part, is of the Archæan formation, succeeded in the nothern part by Cambrian, Silurian and Devonian rocks. Its industries consist of manufactures, which are rapidly growing, agriculture, which is proportionately diminishing, fishing, and commerce. The lumber industry, which was formerly very extensive, has now greatly fallen off. The coast was discovered and explored 1497 by the Cabots. In 1607 Henry IV. of France granted a charter to De Monts to all of North America between 40° and 46° N. lat.; in 1608 he founded a settlement on the St. Croix. In 1607 James I. of England granted to some of his subjects all the territory between 34° and 45° N. lat. This made disputed territory of the region, and the conflict over the frontier continued long. A colony was planted at the mouth of the Kennebec River 1607 and deserted 1608; scattered settlements were made between the Kennebec and the Penobscot. In 1622 a charter was granted to SIR FERDINANDO GORGES (q.v) and Capt. John Mason, covering the territory between the Merrimac and the Kennebec, and extending 60 m. inland. The territory was named the province of M., and was afterward divided, Gorges taking the portion between the Piscataqua and the Kennebec. The following half-century witnessed a series of struggles over territorial boundaries and jurisdiction, Gorges having received from the king a feudal tenure of his territory, but finding great difficulty in maintaining it against encroaching settlers and the increasing claims of the Mass. colony. The disputes were ended by the new charter of William and Mary, which merged the provinces of Plymouth, Mass., Maine, Sagadahock, and Acadia under one title and jurisdiction, "the province of Mass. Bay." Five years afterward the part of the province e. of the St. Croix was ceded back to the crown, and that river has since been the e. boundary of the province and of the U. S. The history of M. was mingled with the history of Mass. until 1820, when M. was recognized as a separate State in the Union. For a long time previous it had been practically an independent State. Pop., 1890, 661,086, or 22 per sq. m.

**Maine,** SIR HENRY JAMES SUMNER, LL.D., F.R.S., 1822–1888. Prof. Cambridge 1847–54; in India 1862–69; prof. Oxford 1870. His books are high authorities in their field. *Ancient Law*, 1861; *Village Communities*, 1871; *Early History of Institutions*, 1875; *Early Law and Custom*, 1883; *Popular Government*, 1885; *International Law*, 1888.

**Maine de Biran,** MARIE FRANÇOIS PIERRE GONTHIER, 1766–1824. French philosopher. *Works*, 6 vols., 1841–59.

**Maine State College.** At Orono, Me.; land-grant institution, founded 1865. It has received from the State ab.


Longitude West 69 of Greenwich
71
67
47
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Longitude East 8 of Washington
NEW BRUNSWICK
QUEBEC
RIVER ST LAWRENCE
ATLANTIC OCEAN
NEW HAMPSHIRE
MAINE
QUEBEC
Edmundston
Madawaska
Frenchville
Fort Kent
Eagle Lakes
Van Buren
St Francis
Grand Falls
Upper L.
E. Perham
New Sweden
Caribou
Fort Fairfield
Mars Ville
Presque Isle
Ashland
Masardis
Blaine
Long Lake
Chandler L
Heron L
Chamberlain L
St Joseph
Quaquoingamoc L
Monticello
Houlton
Woodstock
Hodgdon
Dobec
Fredericton
Cranerus
Potten
Chesuncook L
Sherman
Amity
Bancroft
Schoodic Lake
Danforth
Moose River
Moosehead Lake
Pamadecook
Medway
Eaton
Kingman
McAdam
Weedon
Parlin Pond
Katahdin
Greenville
Lincoln
Carroll
Moroson
Sebec
Milo
Grand Lake
Princeton
Calais
Eastis
Abbot
Foxcroft
LaGrange
Mattatous
St Andrews
Dover
Highland
Parkman
Brighton
Bradford
Parry
Deering
Solon
Dexter
Harmony
Greenfield
Orient Pond
Colper
Pembroke
Eastport
Indian Stream
Rangeley
Fairfield
N. Anson
Old Town
Milford
Campobello I.
Phillips
Anson
Newport
Pittsfield
Bangor
Deblois
Lubec
Richardson Lake
Strong
Farmington
Skowhegan
Hampden
Grand Manan I.
Upton
Andover
Weld
Norridgewock
Dixmont
Machias
Mexico
Wilton
Oakland
Brunham
Fairfield
Brooks
Buckspore
Cherryfield
Ellsworth
Hancock
Gilbertville
Waterville
Belfast
Searsport
Blue Hill
Livermore
Belfast
Palermo
Searsmont
Castine
Bar Harbor
Mt Desert I.
Paris
Windsor
AUGUSTA
Gardiner
Camden
Norway
Leeds Jun
Jefferson
Oxford
Mechanics Falls
Waldoboro
N. Haven
Vinal Haven
Bryant
Auburn
Wiscasset
Rockland
Cascade
Danville
Bath
Brunswick
Squam L.
Hiram
E. Baldwin
Winnipesaukee
Ossipee
Deering
Wolfeborough
Cape Elizabeth
PORTLAND
Acton
Alfred
Saco
Alton Bay
Milton
Biddeford
Wells
Rochester
N. Berwick
Dover
York Beach
Kittery
New Market
PORTSMOUTH
Exeter
Seabrook
Newburyport
Merrimac
WHITE MTS.
EXPLANATION
Capitals
County Seats
Cities & Towns
Rail Roads
Lighthouses L.H.
Life Saving Stations L.S.S.
Scale of Miles
5 10 20 30 40 50 60

$250,000, and offers courses in agriculture, chemistry, and the various branches of engineering. Teaching staff, 23; students (1895), 203. Connected with the college is the State Agricultural Experiment Station.

**Mainotes.** Warlike people of s. Greece, alleged descendants of the Spartans. Some of them, who migrated to Corsica 1676, may have been ancestors of Napoleon.

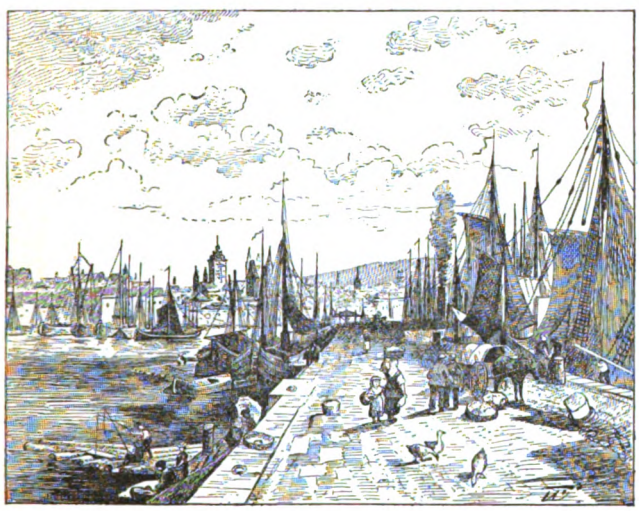
**Maintenance.** Illegal upholding of a litigant; obsolete or abolished as a crime in Britain, and as a tort crime in the U. S.

**Maintenance of the Sun's Heat.** The theory most commonly accepted is that which ascribes it to the gradual shrinking in volume, a contraction of 250 ft. in diameter per year being sufficient.

**Maintenance of Way.** Department of a railroad company which embraces the repair of the roadbed and track, with renewals of rails and bridges. On U. S. railroads the cost is ab. 27 per cent of the total operating expenses.

**Maintenon,** FRANÇOISE D'AUBIGNÉ, MARQUISE DE, 1635–1719. Wife of the poet Scarron 1651–60; governess of Louis XIV.'s children, 1669. She became powerful with the king, was privately married to him 1685, and had a large share in procuring the Revocation of the Edict of Nantes. Her influence was otherwise good, and her life pure.

**Mainz,** MENTZ, or MAYENCE. Strongly fortified city of Hesse-Darmstadt, on the Rhine nearly opposite the mouth of the Main; known to the Romans as Moguntia; destroyed by Huns 451; favored by Charlemagne; head of the Rhenish



Mainz.

league in 13th century; governed by archbishops 1462–1802; taken by Swedes 1631, and by French 1644; held by France 1801–14. Here Gutenberg invented printing ab. 1440. Pop., 1890, 71,395.

**Maiorescu,** TITU, b. 1840. Roumanian author and official.

**Maipu.** Chilian river, on whose banks a Spanish force was defeated and captured, March 19, 1818, in the war of Independence.

**Maison Carrée.** Beautiful and well-preserved Roman temple at Nimes, s. France.

**Maistre,** JOSEPH MARIE, COMTE DE, 1754–1821. Chancellor of Sardinia 1799, Minister to Russia 1803–17. *Soirées de St. Pétersbourg*, 1821. His books on *The Pope*, 1819, and *The Gallican Ch.*, 1821, set forth his ultramontane idealism. *Letters*, 1851–60; *Works*, 4 vols., 1864.—His brother, XAVIER, 1763–1852, lived mostly in Russia, but wrote in French. *Journey Round My Room*, 1794; *Leper of Aosta*, 1811; *Prascovie*, 1825.

**Maitland,** SIR RICHARD, 1496–1586. Scottish statesman, poet, and historian.—His son, WILLIAM, ab. 1527–1573, was active in the troubled affairs of that age, opposed both Knox and Queen Mary, and d. in prison.

**Maitland,** SAMUEL ROFFEY, D.D., F.R.S., 1792–1866. Librarian at Lambeth 1838. *Albigenses*, 1832; *Dark Ages*, 1844.

**Maitreya.** The coming Buddha, who will appear 5,000 years after the enlightenment of Gautama. He is the only Bodhisattvas worshiped by Buddhists everywhere.

**Maize.** *Zea mays.* Tall annual grass, probably native of S. America; widely cultivated for its important grain, unknown in the wild state; called Indian Corn. It is largest and most important grain crop of the U. S. Corn is more or less grown all over the country, but the corn-growing belt includes Ohio, Ind., Ill., Mo., Iowa, Kansas, and Neb. Corn will grow on all soils except the very wet, and loves an abundance of plant food of the richest kind. It is planted in drills or in hills 3 to 4 feet apart each way, according to locality and variety, and cultivated both ways by horse-power. Outside of the corn-growing belt the stalks are cut and harvested with the grain, but where corn is largely grown only the ears are stripped off and the stalks practically abandoned, though cattle are usually turned in to glean what they may. In many parts of the West LISTING (q.v.) is a favorite way of growing corn. Corn meal contains water 15.03, ash 1.45, protein 9.09, fiber 1.85, nitrogen-free extract 68.86, fat 3.72. In the U. S. in 1894 62,582,269 acres were planted with maize, yielding 1,212,770,052 bushels, valued at $554,719,162.

**Majano,** BENEDETTO DA, 1442–1498. Florentine sculptor, known by the marble pulpit in Santa Croce at Florence with reliefs from the life of St. Francis, of which there is a cast in the New York Metropolitan Museum, and the tomb of Filippo Strozzi in Santa Maria Novella, Florence.

**Majesty.** Title applied in speaking to and of a royal person. Among the Romans it used to signify the power and dignity of the people. Its use began in England during the reign of Henry VIII.

**Majolica.** Glazed pottery in general; formerly, and still especially, the historic Italian ware from 15th to 18th century. The color and the glaze were laid on together. The best was

Dish of Italian Majolica, 15th Century.

made in the 16th, and is distinguished by lustrous glaze, beautiful colors, and excellent designs. Urbino was the most important center of the art, which passed to Italy from the Saracens of Majorca, and is hence named.

**Major.** Field officer ranking above a Captain and below a Lieut.-colonel. His appropriate command is a battalion or a squadron.

**Major,** DRUM. Non-commissioned officer who directs the movements of the regimental band while on parade, and commands and instructs the drummers and fifers.

**Major,** or **Mair,** JOHN, ab. 1470–1550. Prof. at Glasgow, Paris, and St. Andrew's; teacher of Knox; opposed to the Reformation; of great contemporary repute and influence. *History*, tr. 1891.

**Major,** RICHARD HENRY, 1818–1891. Cartographer in the British Museum; ed. Columbus's Letters, 1847–72. *Prince Henry the Navigator*, 1868.

**Majorca,** or MALLORCA. Largest of the BALEARIC ISLANDS (q.v.); ab. 100 m. e. of Valencia, Spain. Area 1,310 sq. m.; pop. ab. 235,000. Palma is the capital.

**Major-General.** Officer ranking next above a Brigadier-general and below a Lieutenant-general. His command is properly a division of an army corps. In the U. S. Army there

are now three, the senior, by assignment of the President, being the Commanding General of the army, with headquarters at Washington.

**Majority.** Voting age, 21, in U. S. and Great Britain.

**Major Key,** IN MUSIC. Mode employing a scale in which the semi-tones fall between the third and fourth and seventh and eighth tones ascending.

**Major Orders.** In R. C. Ch., four upper orders of the ministry, subdeacon, deacon, presbyter, and bishop, the three uppermost being also sacramental, and communicable only by a bishop. All four, in the West, obliged to perpetual celibacy and to a clerical life.

**Majuba Hill.** In S. Africa; scene of a defeat of British by Boers of the Transvaal, Feb. 27, 1881.

**Makart,** HANS, 1840–1884. Austrian painter; finest German colorist of the century; successful in large decorative works like *Caterina Cornaro* in the National Gallery of Berlin; *Entry of Charles V. into Antwerp*, in Hamburg; *Diana's Hunting Party*, in the Metropolitan Museum, New York. Fine examples were exhibited at the World's Columbian Exposition, Chicago.

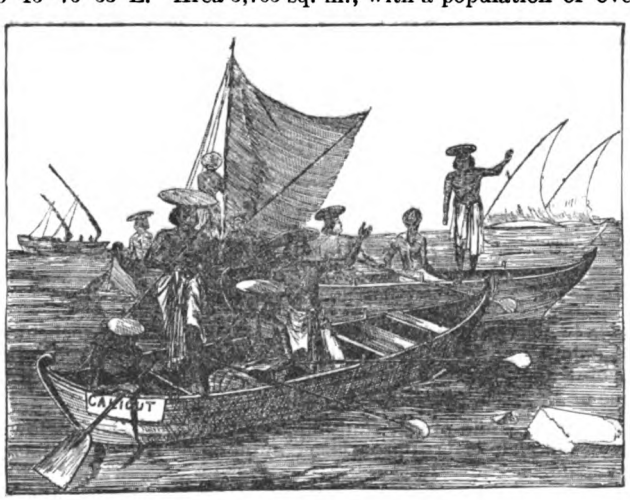
**Makkari,** ABU'L ABBAS AHMED IBN MOHAMMED EL, ab. 1585–1631. Arab historian of Mohammedan Spain, resident at Damascus and Cairo.

**Makololo.** See MARUTSE.

**Makrizi,** TAKI-EDDIN AHMED EL, 1364–1442. Arabic historian of Egypt, of the Mameluke princes, and of Abyssinian kings. Some of his works have been tr. into French.

**Makua.** One of the Bantu tribes, inhabiting the Mosambique region of Africa. They are shy and fear captivity. The women wear a huge ring in the upper lip, and the teeth are filed pointed. Different parts of the tribe are distinguished by different tattooing. The hair is dressed to stand up like a square stub. Pearl crosses are worn on the brow. An apron constitutes full dress. In greeting the hands are clapped, the number of times being apportioned to the rank of the person greeted. The chief is waited on by his wives, 100 or more. When the chief dies he is buried sitting; sometimes living men are inhumed with him. His subjects are buried at full length. Magic and evil spirits are worshiped. The Makua are fond of oratory, two speakers assisting each other, as in a duet.

**Malabar.** District of India; lat. 10° 15′–12° 18′ N.; long. 75° 15′–76° 55′ E. Area 5,765 sq. m., with a population of over



Boatmen on the Malabar Coast.

2,500,000. The coast region is low but the interior mountainous. Chief products are pepper, teak, rice, ginger and coffee. The name is also given to the s.w. coast of India.

**Malacca.** See MALAY PENINSULA.

**Malacca.** Old Malay town, in lat. 2° N.; taken by Portuguese 1511, by the Dutch 1641; held by Gt. Britain 1795–1818 and since 1824. Pop. ab. 20,000.

**Malacca,** STRAIT OF. Between Sumatra and the Malay Peninsula; length 480 m.

**Malachi.** Hebrew prophet, ab. 430 B.C.; author of 39th and last O. T. book.

**Malachite.** $2CuO,CO_2.H_2O$. Green hydrous copper carbonate, containing 57.5 per cent of the metal; valuable both as an ore and as a decorative stone. It occurs in small quantity with other ores of copper as a product of alteration, and has been found in abundance in the Ural Mountains.

**Malachite Green.** See BENZALDEHYDE GREEN.

**Malachy,** ST., 1095–1148. Bp. of Connor 1125, Abp. of Armagh 1134–37, Bp. of Down 1137; papal legate 1141; active in bringing Ireland under papal authority; canonized 1266. His name is falsely attached to certain fraudulent prophecies.

**Malacobdella.** See HAPLONEMERTEA.

**Malacodermata.** Division of Coral Polyps (*Zoantharia*), characterized by secreting no true corallum. The chief groups are *Hexactiniæ*, with the mesenteries and tentacles in multiples of six, as in the ordinary Sea Anemones (*Actinidæ*), *Paractiniæ*, with the parts in fours, *Cerianthidæ*, living in tubes in the sand, *Ilianthidæ*, with rounded base, and *Zoanthidæ*, which are compound structures.

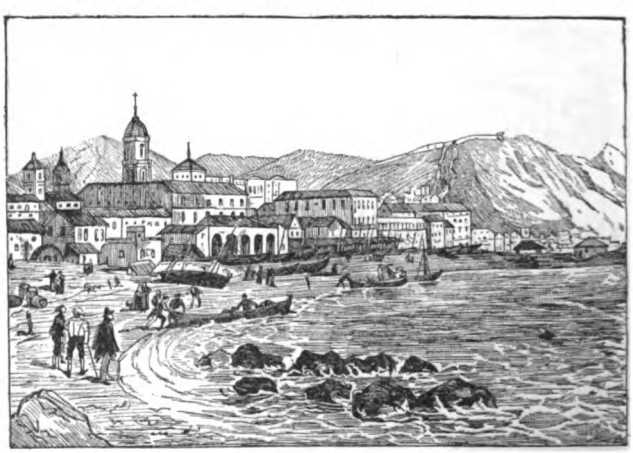
**Malacopteri,** or MALACOPTERYGII. Physostome fishes, divided into the groups ABDOMINALIA and APODA (q.v.).

**Malacoscolices.** See MOLLUSCOIDA.

**Malacostraca,** or THORACIPODA. Hard-shelled *Crustacea*. They are of large size, have the head and thorax fused into one piece (cephalothorax), which contains 13 segments bearing appendages. The abdomen is composed of six movable and appendage-bearing segments, and ends in a median plate, the telson. The group is subdivided into the *Leptostraca*, *Arthrostraca*, and *Thoracostraca*.

**Malacozoa.** MOLLUSCA and MOLLUSCOIDEA (q.v.).

**Malaga.** Ancient seaport of s. Spain, at the head of Malaga



Malaga.

Bay; founded from Carthage; held by Moors ab. 710–1487; noted for its exports of fruits and wines. Pop., 1887, ab. 134,000.

**Malakoff.** Hill and tower near Sevastopol, strongly fortified by Russians 1854–55; attacked June 17 and 18, 1855, by allied French and English, who were repulsed with loss of 4,640 killed and wounded; taken by the French Sept. 8.

**Malan,** CÉSAR HENRI ABRAHAM, D.D., 1787–1864. Pastor at Geneva 1820–63. He and his books were popular in England. —His son, SOLOMON CÆSAR, D.D., b. 1812, took Anglican orders, wrote much, and tr. many Oriental works.

**Malaprop,** MRS. In Sheridan's *Rivals;* given to substituting one word for another of similar sound; the progenitor of Mrs. Partington.

**Mälar.** Lake of Sweden, w. of Stockholm. Length 80 m., area 650 sq. m.

**Malaria.** Infectious disease, caused by the *plasmodium malaria*, characterized by fever of an intermittent, remittent and pernicious type. It has the widest geographical distribution of all the infectious diseases; especially prevalent in the tropics, and in marshy localities. Treatment consists of quinine, aided later by tonics, as iron and arsenic.

**Malay.** One of the Oceanic group of languages.

**Malayan Race.** Characterized by yellow-brown to black colored skin, close, black, loose hair, broad, thick nose, turned-up lips and prognathous jaws; one of the five great divisions of man according to Blumenbach; living on the islands of the Pacific and Indian Oceans, the Malay Peninsula and Archipelago, Australasia, and Madagascar. But modern ethnologists

recognize three distinct races in these regions: the NEGRITOES, MALAYS, and AUSTRALIAN ABORIGINES (q.v.). The Malays may be derived from the Mongols.

**Malay Apple.** *Eugenia malaccensis.* Tree of the natural family *Myrtaceæ*, native of the East Indies, cultivated for its edible fruit, which is the size of a small apple.

**Malay Peninsula.** Promontory projecting s. from s.e. Asia, comprising part of Siam, Malaya, and the port of Malacca. It is traversed by a range of mountains, and is 750 m. long and 120 m. wide.

**Malays.** People of two branches, the Eastern or Polynesian and the Western or Malay proper, inhabiting the Malay Peninsula, Sumatra, Java, and adjacent East Indian islands, including Borneo. They are of light copper-brown complexion, have straight hair, black eyes, and large mouth with thick lips, are stern and serious in disposition, good sailors, brave, but high-tempered when aroused. "Running amok" is characteristic of

Malay Native of Borneo.

Malays whose passion for killing is excited. They use meat only on festal occasions. The women are skillful in fine embroidery work, the men make fine tools. The Javanese are the highest in civilization. They have been influenced by Indian elements. Most Malays are Mohammedans, but in the interior of the larger islands primitive cannibalism still survives. Descent is counted on the female side.

**Malbone,** EDWARD GREENE, 1777–1807. American portrait-painter, eminent for his miniatures.

**Malcolm I.** King of Scotland 943–954.—II. 1005–34.—III. "Canmore," avenger of Duncan and slayer of MACBETH (q.v.); King 1057–93; at war with the Norman conquerors.—IV. 1154–65.

**Malcolm,** SIR JOHN, 1769–1833. British officer, envoy to Persia 1800, 1807, and 1810; long in India, and prominent in the last Mahratta wars; knighted 1812; Gov. of Bombay 1827–30; M.P. 1831. *Hist. Persia*, 1815; *Political Hist. India*, 1826; *Life of Clive*, 1836.

**Malczewski,** ANTONI, 1793–1826. Polish poet. *Marya*, 1825.

**Malden.** City of Middlesex co., Mass., 5 m. n. of Boston. It has extensive manufactures. Pop., 1890, 23,031.

**Maldive Islands.** In the Indian Ocean, w. of Ceylon, between lat. 7° 7′ N. and 0° 42′ S., long. 72° 30′–73° 50′ E.; of coral formation, small and very numerous. Ab. 200 are inhabited. Pop. ab. 20,000.

**Maldonite.** $Au_2Bi$. Native combination of gold and bismuth, found at Maldon, Australia.

**Malebranche,** NICOLAS, 1638–1715. French philosopher, disciple of Descartes; famous for the doctrine of seeing all things in God and the theory of occasional causes, by which mind and matter, not being naturally connected, were arbitrarily and miraculously conjoined. *Recherche de la Verité*, 1674; *Traité de la Morale*, 1684; *De l'Amour de Dieu*, 1697.

**Malecki,** ANTONI, b. 1821. Polish grammarian, essayist, and dramatist, prof. Lemberg 1856–73.

**Malesherbes,** CHRÈTIEN GUILLAUME DE LAMOIGNON DE, 1721–1794. French official and Academician of high character and great repute; pres. Cour des Aides 1750–71; censor of the press; eminent for wisdom and liberality; Minister of the Interior 1774–76; guillotined for defending Louis XVI. *Œuvres Choisies*, 1809.

**Malet,** CLAUDE FRANÇOIS DE, 1754–1812. French general 1799–1807; executed for plotting against Napoleon.

**Malet,** LUCAS. See HARRISON, MARY.

**Malherbe,** FRANÇOIS DE, 1555–1628. French court poet, regarded as a literary reformer, though his productions are of small value.

**Malheur Lake.** In s.e. Oregon. It receives the waters of several streams, but has no outlet. Area 117 sq. m.

**Malibran,** MARIA FELICITÀ, 1808–1836. Dramatic singer, of contralto voice with soprano range; daughter and pupil of Garcia (1775–1832); in New York 1825–27, and thenceforth chiefly in London and Paris.

**Malic Acid.** $COOH.CH_2.CHOH.COOH$. Mpt. 100° C. Dibasic acid, very widely distributed in the vegetable world, especially in unripe apples, quinces, and other fruits; colorless solid, exceedingly soluble in water. It can be prepared by the reduction of tartaric acid.

**Malice.** Settled feeling of ill-will toward a person, prompting to an infliction of pain or harm.—In Law, either absence of legal excuse, or a corrupt motive.

**Malicious Mischief.** Statutory offense of wantonly injuring another's property.

**Malicious Prosecution.** Injuriously prosecuting another from a malicious motive and without probable cause.

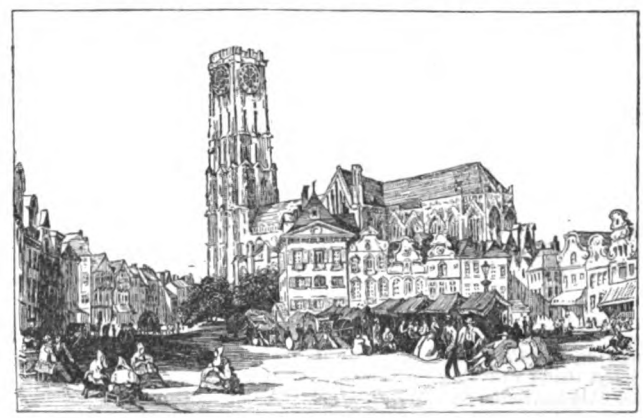
**Malignant Diseases.** Diseases that tend toward a fatal issue, as CANCER (q.v.), or certain forms of zymotic diseases with intense infection.

**Malignant Pustule.** External ANTHRAX (q.v.). Carbuncle-like inflammation that develops at the site of infection with the anthrax baccillus.

**Malignants.** Adherents of Charles I., so styled by the Puritans.

**Malignity.** Feeling which leads one to take pleasure in another's pain.

**Malines,** or MECHLIN. City of Belgium, on the Dyle, 14 m. s. of Antwerp; once famous for its laces. In the 14th century



Cathedral of Malines.

its cloth manufactures employed 3,000 workmen. The cathedral of St. Rombaud, with a steeple 320 ft. high, contains the *Last Supper*, by Rubens. Pop., 1891, 51,558.

**Malingerer.** Soldier who feigns illness to avoid duty.

**Mallard.** *Anas boschas.* Wild duck, from which ordinary domestic ducks have been derived. The female is brownish, the male green on head and neck, with narrow white collar. They nest usually on the ground near water.

**Mallarmé,** STÉPHANE, b. 1842. French poet of the Décadent school.

**Malleability.** That specific property of matter in virtue of which it can be beaten out into thin plates or sheets. Gold is the most malleable substance, having been beaten out into leaves 0.000003 of an inch thick. When of this extreme tenuity, it is found to transmit a greenish light, complementary to the yellow which it reflects.

**Mallery,** GARRICK, U.S.A., LL.D., 1831–1894. American

ethnologist. *Our Indians*, 1878; *Sign Language*, 1880–81; *Picture-Writing*, 1893.

**Mallet.** Wooden hammer used by stonecutters. Those used by the ancient Egyptians were shaped like pestiles.

**Mallet,** DAVID, 1698–1765. Scottish-English poet and pensioner.

**Mallet,** JOHN WILLIAM, LL.D., b. 1832. Prof. of Chemistry Univ. Va. 1867–83 and since 1885; author of many papers on chemical subjects.

**Mallet,** JULES THÉODORE ANATOLE, b. 1837. French engineer, who in 1875 produced the first compound locomotives.

**Mallet,** ROBERT, 1810–1881. English geologist, author of important matter upon Earthquake phenomena. His great Earthquake Catalogue was completed 1858. His *Volcanic Energy*, 1873, was a valuable contribution to the physical geology of volcanoes and their relations to earthquakes and mountain-structure.

**Malleus.** Outermost of the auditory ossicles of mammals, corresponding to the articulare of the lower vertebrates.

**Mallock,** WILLIAM HURRELL, b. 1849. English essayist, novelist, and poet. *The New Republic*, 1877; *New Paul and Virginia*, 1878; *Is Life Worth Living?* 1879; *Social Equality*, 1882; *Popular Welfare*, 1894. His works are largely satires in the R. C. interest.

**Mallophaga** (ANOPLURA). Apterous Rhynchota, with biting mouth parts and a suctorial proboscis. They feed on young hairs, feathers, and blood. They are the lice of birds and some mammals, as the Dog. See ANOPLURA.

**Mallory,** GEORGE SCOVILL, D.D., b. 1838. Prof. Trinity Coll. 1862–72; manager *Churchman* since 1866.

**Mallory,** STEPHEN RUSSELL, 1813–1873. Collector at Key West, Fla., 1845; U. S. Senator 1851–61; Confederate Sec. Navy 1861–65.

**Mallow.** Plants of the genus *Malva*, herbs of the natural family *Malvaceæ*, natives of the n. hemisphere. Many European species have been introduced into America as weeds. *M. rotundifolia*, the commonest, is known also as Cheeses. *M. moschata* is the Musk Mallow.

M. silvestris.

**Mallow,** FALSE. Species of the genus *Malvastrum*, plants much resembling Mallows, and of the same natural family, natives of warm climates.

**Mallow,** GLADE. *Napæa dioica*. Tall herb of the Mallow family, native of the s.e. U. S.

**Mallow,** INDIAN. See VELVET-LEAF.

**Mallow,** MARSH. *Althæa officinalis*. Tall perennial herb of the Mallow family, with a thick mucilaginous root; native of Europe; introduced into salt marshes in the n.e. U. S. A confection is made from the root.

**Mallow,** ROSE. Showy-flowered plants of the genus *Hibiscus*, natural family *Malvaceæ*, of wide distribution in temperate and warm regions.

**Malmaison.** Villa on the Seine, 9 m. w. of Paris, built by Richelieu; restored 1861. Here Josephine died 1814, and here the Germans repelled a French attack, Oct. 21, 1870.

**Malmesburg,** JAMES HARRIS, FIRST EARL OF, 1746–1820. English envoy to Prussia 1772 and 1793, to Russia 1777, and to Holland 1784; Knight 1779, Baron 1788, Earl 1800.—His grandson and biographer, JAMES HOWARD, 3d Earl, 1808–1889, was Foreign Sec. 1852 and 1858–59, and Privy Seal 1866–68 and 1874–76. *Memoirs*, 1884.

**Malmesbury,** WILLIAM OF, ab. 1095–ab. 1143. English monk, author of *Gesta Regum*, *Gesta Pontificum*, and *Historia Novella*, which cover the period to 1142.

**Malmö.** Seaport of s. Sweden, on the sound; once fortified and commercially important. A treaty with Denmark was concluded here 1523. Pop., 1890, 48,500.

**Malmsey.** Wines formerly exported from the Levant, now mainly from Madeira and Sicily.

**Malmström,** BERNHARD ELIS, 1816–1865. Swedish poet, prof. Upsala 1856. *Works*, 8 vols., 1866–69.—His brother, KARL GUSTAF, b. 1822, prof. Upsala 1858, Cabinet Minister 1878, pub. *Hist. Sweden*, 1855–77.

**Malone,** EDMOND, 1741–1812. Irish critic, editor of Shakespeare, 1790–1821. He exposed the forgeries of Chatterton, 1782, and Ireland, 1796. *Hist. English Stage*, 1790.

**Malory,** SIR THOMAS, ab. 1400–1470. Author or compiler of the *Morte d'Arthur*, pub. 1485.

**Malot,** HECTOR, b. 1830. French novelist. *No Relations*, 1878; *Conscience*, 1889.

**Malpighi,** MARCELLO, 1628–1694. Italian anatomist and botanist, prof. at Pisa 1656, Messina 1662, and Bologna 1666–91. *Epistolæ Anatomicæ*, 1662; *Anatomia plantarum*, 1675; *Opera omnia, seu thesaurus locuplitissimus botanico-medico-anatomicus*, 1687.

**Malpighiaceæ.** Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Dicotyledons*, comprising 52 genera and ab. 600 species, mostly shrubs and woody vines, widely distributed throughout the tropics.

**Malpighian Tubes.** Thread-like diverticula of the hind gut in insects, etc., probably excretory or kidney-like infunction.

**Malplaquet,** BATTLE OF. In n. France, Sept. 11, 1709; defeat of French under Villars, by British and Dutch under Marlborough and Eugene; very destructive on both sides.

**Malpractice.** Treatment of diseases and injuries contrary to approved principles. Also, the unlawful production of abortion. See MEDICAL JURISPRUDENCE.

**Malt.** Grain subjected to artificial germination and then dried in a kiln to destroy its vitality. Barley is generally used; but wheat, oats, rye, and corn may be substituted. The barley is steeped in water for 3 to 4 days and then placed upon the cemented malting floor to germinate or grow for 10 to 12 days, being turned over to keep it cool. When the germ is three-fourths the length of the grain it is dried in a kiln, heated by hot air, for 3 to 4 days, to kill the germ. The germination produces DIASTASE and MALTOSE (q.v.).

**Malta,** anciently MELITA. Island in the Mediterranean, s. of Sicily; colonized by Phœnicians, taken by Romans 259 B.C., by Vandals 534, by Arabs 870, and by Normans from Sicily

The Island of Malta.

1090; given by Charles V., 1530, to Knights Hospitalers, who defended it against the Turks 1551 and 1565; taken by Bonaparte, June 1798; surrendered to the British, Sept. 5, 1800. Area 95 sq. m.; pop., 1890, 165,662.

**Malta,** KNIGHTS OF. See KNIGHTS OF ST. JOHN.

**Malte-Brun.** See BRUUN, M. C.

**Maltha.** Semi-solid or viscid bitumen, ranging in consistency from a heavy petroleum to a nearly solid asphaltum, becoming more solid by oxidation on exposure to the air.

**Malthus,** THOMAS ROBERT, 1766–1834. English divine and economist, prof. at Haileybury from 1805. His *Principle of Population*, 1798, being the first statement of important ideas, caused great commotion.

**Malthusianism.** Principle enunciated and illustrated by Malthus, that population tends to increase beyond the limit of subsistence, except in so far as it is kept down by preventive checks, or the positive checks of famine, disease and war.

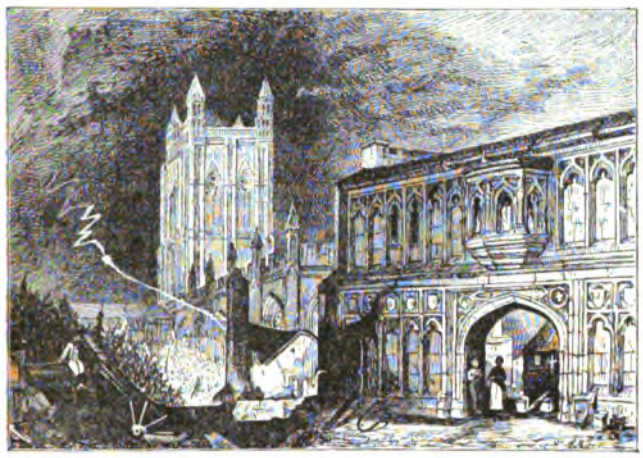
**Maltose.** $C_{12}H_{22}O_{11},H_2O$. Malt sugar, which occurs in some commercial glucoses, beer, and germinated cereals. Diastase converts starch and dextrins into it. Some acids

acting on starch also produce it to some extent. It is dextro-rotatory and of slightly sweet taste.

**Malus,** ÉTIENNE LOUIS, 1775–1812. French military engineer, who confirmed the laws of double refraction that had been laid down by Huygens, and was the first to observe polarization of light by reflection.

**Malvaceæ.** Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Dicotyledons*, comprising ab. 64 genera and 700 species, widely distributed throughout all parts of the earth except the Arctic regions; called the Mallow family.

**Malvern.** Summer resort in Worcestershire, England. It



Malvern Abbey and Gate.

is much frequented on account of its beautiful scenery, the salubrity of its climate, and its saline and alkaline springs. Pop. 8,500.

**Malvern Hill.** In Va., 15 m. s.e. of Richmond; scene of battles July 1, 1862 (see SEVEN DAYS' RETREAT); Aug. 6, 1862; June 15, and July 27 and 28, 1864.

**Mameli,** GODFREDO, 1826–1849. Italian poet, killed while serving under Garibaldi.

**Mamelukes,** or MAMLOOKS. Turkish and Circassian slaves in Egypt, who became the Sultan's bodyguard, and were the masters of Egypt 1250–1517. They retained much power till destroyed at the battle of the Pyramids, 1798; the remnant were massacred by Mehemet Ali 1811, or at New Dongola 1820.

**Mamertine Prison,** or TULLIANUM. Long the only prison in Rome. It is of circular form, and the living tufa rock of the Capitoline Hill forms part of the inclosing wall. Above this is a four-sided room with arched roof, and over this the floor of a church, 16 ft. above the level of the forum. A hole in this floor is the sole entrance to the upper chamber, and a like opening leads into the lower dungeon. There is no evidence that St. Peter or St. Paul was ever confined here.

**Mamertini.** Freebooters who ruled Messina, Sicily, 288–241 B.C. Their coins are abundant.

**Mamiani della Rovere,** TERENZIO, COUNT, 1800–1885. Italian author, prof. Turin and Minister of Instruction 1860.

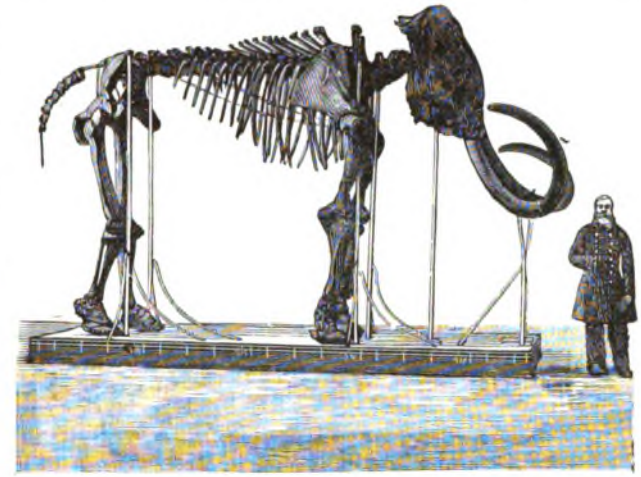
**Mammalia.** Highest class of Vertebrates. They are warm-blooded, hairy, viviparous, and suckle their young with milk secreted by mammary glands. The skull has two occipital condyles. Sometimes the hairs are modified to form quills, scales, or plates. The cervical vertebræ are almost constantly seven, whatever the length of neck; the dorsal vary in the neighborhood of thirteen, the lumbar ab. seven, the sacral ab. four, and the caudal indefinite. The clavicles are often absent, and the coracoid rudimentary. The number of fingers and toes, never more than five, is often reduced, beginning on the inner or thumb side and thence alternating on the outer and inner sides until, as in the horse, only the middle digit is left. The cerebral hemispheres are greatly developed, and a corpus callosum is usually present. The outer and inner parts of the ear are united by a chain of three auditory ossicles. As a rule a tongue and teeth (of three sorts, canines, incisors, and grinders) are present. The heart is four-chambered, as in Birds, but the left aortic arch persists as the systemic aorta. Male intromittent organs are always present, the testicles (at least during rut) are let through the inguinal canal into a scrotum. The eggs are small: the early stages of the embryo are passed in a uterus, except in the *Platypus*, which is oviparous. In the larger mammals the period of gestation is longer than six months, and the number of young is small. Both migratory and hibernating mammals exist. The class falls into two sections: APLACENTALIA and PLACENTALIA (q.v.).

**Mammato-Cumulus.** Form of cloud called globo-cumulus by Poey, and known as the pocky cloud in the Orkneys; so named by C. Lay 1875. The cloud is apparently a mass of large rolling balls of vapor, piled up over each other.

**Mammee Apple.** *Mammea americana.* Tall tree of the natural family *Guttiferæ*, native of tropical America, bearing a large, yellow, edible fruit.

**Mammillæ.** Spinnerets of spiders; short-jointed protuberances whose ends are pierced by holes through which the secretion of the spinning glands passes to harden into the fibers composing the spider's thread.

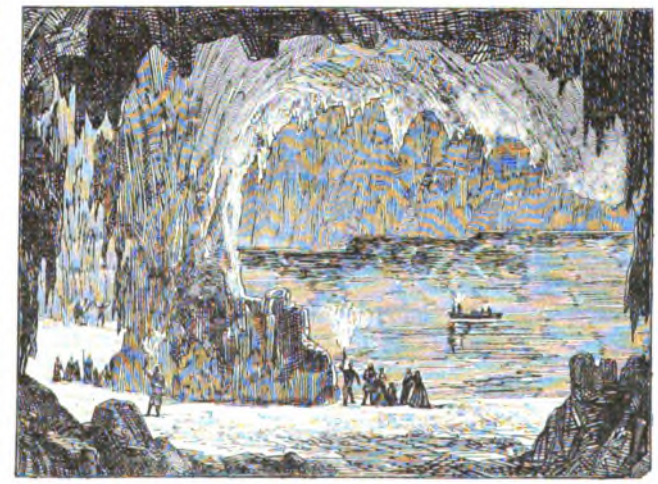
**Mammoth.** *Elephas primigenius.* Largest and most specialized of the Elephants; now extinct. Abundant remains are found in n. temperate to arctic regions of both continents, the greatest collection of bones being at the mouth of the Lena River. Here ab. 1795 an entire specimen was found frozen in the ice in so good condition that the meat was eaten by the dogs of the discoverers. It was covered with brown wool 10 in. long, with scattered black bristles and a mane. Its stomach contained pine needles and shoots. The largest tusks are 10 ft. long. They curve greatly, making nearly a spiral. These



The American Mammoth (*Elephas primigenius*).

animals lived on the margin of the advancing and retreating ice sheet of the glacial period. Relics of them are found with the remains of man in the caves of s. France. A mammoth's tusk was found there 1864, on which was a drawing scratched, of a mammoth, apparently by one of the early men who had seen the animal alive. A skeleton is now in the Imperial Museum at St. Petersburg. A restoration by Dr. Fraas of Stuttgardt, was recently in a museum at Rochester, and a mounted skeleton is in possession of Chicago Academy of Sciences. See IVORY.

**Mammoth Cave.** In Ky., near Green River, 85 m. s.s.w. of Louisville; discovered 1809, and much visited, but not fully



Mammoth Cave, Kentucky.

explored. Its ramifications, so far as known, extend fully 150 m. Some of the cave animals have become white and blind while others still have their natural color and eyes.

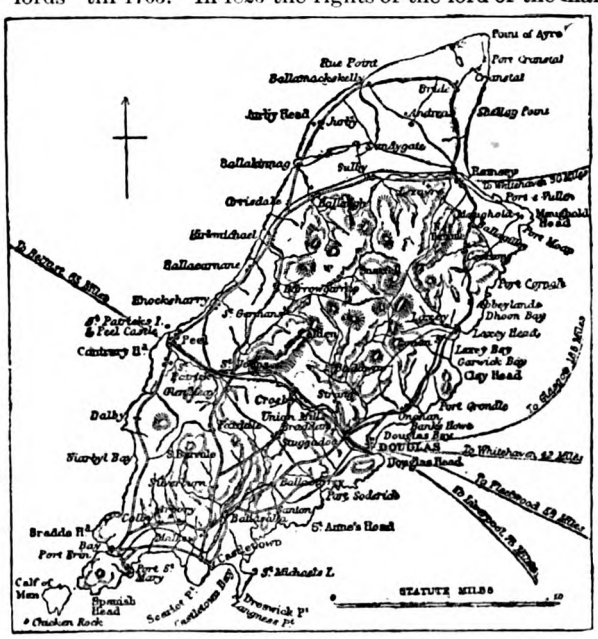
**Mammoth Powder.** Composed of large grains, ab. 85 to the pound; formed by breaking up mill-cake; designed by Gen. Rodman for use in the 15-in. smooth-bore gun.

**Mammoth Tree.** *Sequoia gigantea.* Largest tree of the natural family *Coniferæ*, attaining a height of over 300 feet; native of California; sometimes planted for ornament.

**Mamun,** ABUL ABBAS, 786–834. Son of Haroun al Raschid; Caliph of Bagdad from 813, reigning as Abdallah III.; patron of letters.

**Man.** For the zoölogical characters of Man see ANTHROPIDÆ, where he is regarded as a sub-order of Primates. The characters that differentiate Man from the other Primates are of no greater moment than those which distinguish the different families of Apes; yet there have been authors who on psychic grounds have put Man in a group over against the animal kingdom. Cuvier constituted Man an order, Linnæus a family only. Agassiz thought man to be of several distinct species. Blumenbach distinguished five races, characterized by the form of head, color of skin, and structure of hair; viz., Caucasian, Mongolian, Ethiopian, American, and Malay: Cuvier deemed the last two mere varieties of the Mongolian. In modern times Retzius has distinguished the Orthognathi and Prognathi, each of which may be divided into the Dolichocephalic and Brachycephalic types. Huxley has grouped mankind as Ulotrichi (woolly-haired), Ethiopians; Leiotrichi (smooth-haired), including three sections; Australioid (the Malays); Mongolioid (Mongolians and American Indians); and Iranian (Caucasian), subdivided into the Melanochroi and Xanthochroi.

**Man,** ISLE OF. In the Irish Sea; held in turn by Welsh, Norwegians, and Scots; subject to England from 1290; ruled, under forms of its own, by Stanleys as "kings" 1406–1651, and as "lords" till 1765. In 1825 the rights of the lord of the manor




Isle of Man.

were purchased by the nation for £417,144. The Manx language is still spoken in the n.w. section. Its coins bear the triquetra. Its peculiarities are familiar of late through the novels of Hall Caine. Capital, Douglas; area 227 sq. m.; pop., 1891, 55,598.

**Manaar,** GULF OF. Part of the Indian Ocean, separating Ceylon from India; noted for pearl-fisheries.

**Manabrea.** See MENABREA.

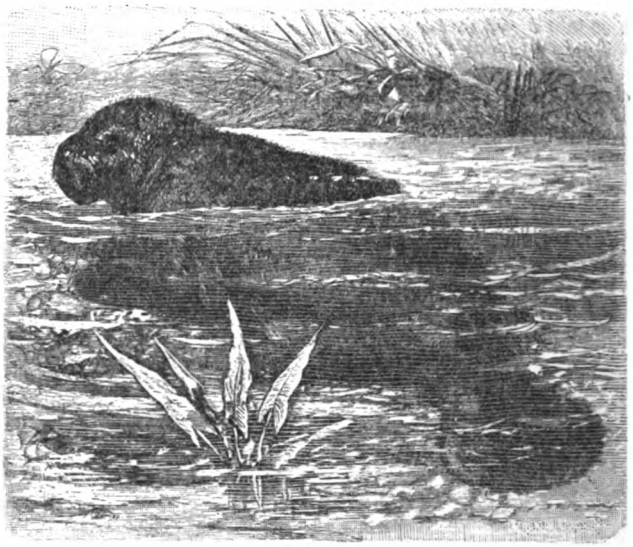
**Managua.** Lake of Nicaragua.

**Manassas,** BATTLES OF. See BULL RUN.

**Manasseh.** 1. Elder son of Joseph, and progenitor of that tribe which took the place of Levi. 2. King of Judah ab. 697–642 B.C.; son of Hezekiah; prisoner in Babylon 675. A Prayer ascribed to him is among the Apocrypha.

**Manasseh ben Israel,** 1604–1657. Portuguese Jew, printer and author at Amsterdam.

**Manatee** (TRICHECHUS). Sea cow; genus of the order *Sirenia*; whale-like mammal living in the mouths of rivers of w. Africa, S. America, and Florida. They feed on sea-weeds. The teeth number 36 to 40. Hind legs are wanting; the tail is developed as a horizontal fin. The fore limbs are flippers, the phalanges of the thumbs are absent. The skin resembles that of the elephant. They attain a length of 12 to 20 ft., are monogamous, sluggish, and gentle. Their flesh is very palatable. Six fossil genera are known, and two modern genera related to the sea cows: one, *Halicore*, is the Dugong of the



Manatee (*Manatus latirostris*).

Indian Ocean; the other is *Rhytina* of the Siberian Pacific, the last specimen of which was killed 1768: it had the metacarpals and phalanges entirely absent. These animals are the basis for the mermaid myths.

**Manby,** GEORGE WILLIAM, 1765–1854. English inventor of apparatus for life-saving, by which nearly 1,000 were rescued from wrecks 1808–54.

**Mancala.** Arab game, played by two persons with pebbles, seeds, or other small objects in two parallel rows of holes, usually cut in a board, or scooped in holes in the ground. It extends wherever Arab influences have penetrated from the Philippine Islands to the Cape of Good Hope, and is known to almost every tribe throughout Africa. It has recently been introduced by negroes into the West Indies, and is sold in the U. S. as Chuba.

**Manchester.** City of Lancashire, on the Irwell; largest center of manufactures of cotton in the world; headquarters of the anti-corn-law league 1839; made a parliamentary borough 1832, a bishop's see 1847, and a city 1853. Its production of cottons began in 1550, but its growth is mainly recent. Pop., 1893, 515,598, or, with Salford, 719,029.

**Manchester.** City of Hillsboro co., N. H.; on both sides of the Merrimack, which furnishes excellent water power; founded 1772, chartered as a city 1846. The principal industry is the manufacture of cotton goods. Pop., 1890, 44,126.

**Manchester,** EDWARD MONTAGU, 2d EARL OF, 1602–1671. General of the Parliament, slow and obstructive.—His grandson, CHARLES, 4th Earl, d. 1722, became duke 1719.

**Manchester Canal.** Ship canal, 35½ m. long, connecting Manchester, England, with tide-water. It is 120 feet wide and 26 feet deep, and has a total lift of 60 feet, which is overcome by four locks, the largest 500 feet long and 80 feet wide. The work was begun 1887; the canal was opened Jan. 1, 1894. The cost was ab. $80,000,000.

**Manchester Massacre.** See PETERLOO.

**Manchester New College.** Unitarian theol. sem., so named 1840. It grew from a school at Warrenton, removed to Manchester 1786 and to York 1803. It was in London 1853–89, and has since been at Oxford. James Martineau was its Prof. of Philosophy 1840–85.

**Manchester School.** Those writers on political economy who have carried to its furthest extreme the assumption of the advantages of freedom of trade and of competition, and the injurious results arising from the intervention of government.

**Manchester Yellow.** See DINITRONAPHTHOL.

**Manchineel.** *Hippomane mancinella.* Large tree, native of the W. Indies, the sap of which is poisonous to the skin.

**Manchu Invasion of China.** The Manchu Tartars first invaded China in 10th cent., when they established the Leaou dynasty in n. China. Two centuries later they made a second inroad, and established the Kiu dynasty, which was banished from China by Jenghiz Khan. They again invaded China 1616, took the province of Lean-tung 1619. In 1620 the Manchu sovereign, Teeu-wing, declared himself independent. In 1642 Peking was taken by rebels; the last emperor of the Ming

dynasty committed suicide, and the Manchus were invited to drive out the rebels. They did so, but refused to leave the empire, and established the Ta-tsing dynasty, which has continued to the present time.

**Manchuria.** N. e. part of Chinese empire. Area ab. 362,000 sq. m.

**Mancini.** Five nieces of Mazarin, wives of various nobles and alleged mistresses of Louis XIV.

**Mancini,** PASQUALE STANISLAS, 1817–1888. Prof. of Law at Turin and Rome; Minister of State 1862 and 1881–83.

**Manco Capac.** Mythical founder of Peruvian civilization, said, with his wife Mama Ogllo, to have risen out of Lake Titicaca, and taught men the arts of life. He probably represented a solar priesthood, gradually extending its rule as a line of Incas, or Children of the Sun. His namesake, the last inca, d. 1544, was in alliance with the Spaniards 1533-36, and then hostile to them.

**Mandæans,** or MENDÆANS. Sect of supposed Gnostic origin, still extant in small numbers in s. Babylonia. It has several sacred books.

**Mandalay.** Capital of Upper Burmah, on the Irawaddy; founded 1860; taken by the British 1885; partly burned 1892.

Mandalay.

The city proper is inclosed by a square brick wall, each side of which is over a mile long. Principal manufacture is silk weaving. Pop., 1891, 188,815.

**Mandamus.** Judicial writ by a common-law court, commanding the performance of an official duty, ministerial and not discretionary in its nature. Its grant or refusal is generally appealable.

**Mandans.** Indian tribe of Montana, of Sioux affinities, but enemies of the Dakota Sioux; friendly with the whites; so nearly white in color that they have been supposed (but without good evidence) to represent the lost Welsh colony founded by Madoc 1170. They lived in circular compartment houses, each accommodating half a dozen families. The men wear jackets, the women sacks. The tribe has been reduced to a few hundred by smallpox. They are on a reservation on the Yellowstone with the Pawnees.

**Mandarin Duck.** Chinese duck, noted for having ruffs on the sides of its neck.

**Mandarins.** Chinese officials, so called by Europeans.

**Mandate.** In Roman law, agreement to do some act for another. The modern law of agency is derived from it. In English law, the term is often applied to a bailment when the bailer is to do something gratuitously.

**Mandel,** EDOUARD, b. 1810 in Berlin. Engraver, whose work is characterized by exceeding purity and sweetness of line. *Charles the First*, after Van Dyke; *Marguerite*, after Kaulbach; *La Bella du Titien*.

**Manderson,** CHARLES FREDERICK, b. 1837. U. S. Senator from Neb. since 1883.

**Mandeville,** BERNARD, ab.1670–1733. English satirist of Dutch birth. His *Fable of the Bees*, 1714–28, was answered by Berkeley, Law, and others.

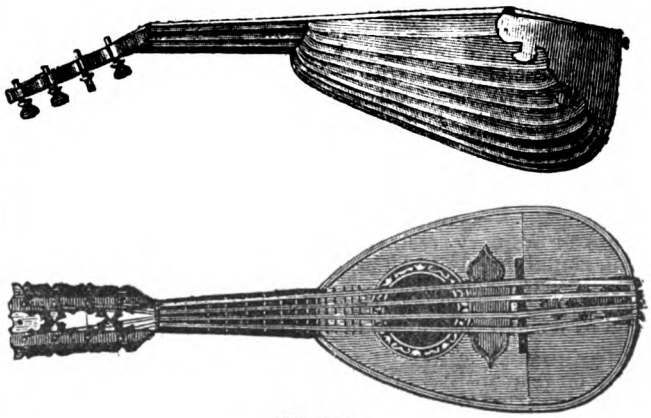
**Mandeville,** SIR JOHN, 1300–1372. Traveler in Asia and Egypt, whose book, compiled from older authors, appeared in several languages and was widely read. His real name and nationality are uncertain.

**Mandibles.** Lower jaw of vertebrates; principal paired chewing organs of Arthropods. The latter move sidewise in chewing, and not vertically, as do the jaws of higher animals.

**Mandingoes.** People of w. Africa, n. of Gulf of Guinea; Mohammedans, mostly independent; said to number some 5,000,000.

**Mandioc.** *Manihot utilissima.* Tall herb of the Spurge family, native of S. America, from which CASSAVA (q.v.) is obtained.

**Mandolin.** Stringed musical instrument of the lute tribe, especially popular in Italy, where it is generally used to produce the melody to guitar accompaniment. Its body is gourd-



Mandolin.

shaped: it is strung with 4, 5 or 6 pairs of unison metal strings, timed in fifths. A plectrum of tortoise-shell is used in plucking them. The finger-board is fretted like that of a guitar.

**Mandrake.** See MAY APPLE.

**Mandrill.** African Baboon (*Cynocephalus*), having large ischial callosities, colored crimson in adult males, a very large head with long muzzle, red at end, with nostrils terminal, and on each side of the bridge of the nose a swollen area consisting of longitudinal bright-blue welts with scarlet crests. The general color is olive-brown. A full-sized Mandrill is 5 ft. long. The Drill is a similar but smaller baboon, with less brilliant colors, black face, and white beard. See BABOONS.

**Man-Engine.** Combination of stout, heavy rods and small platforms in a mine shaft, by which men may enter or leave a mine without using ladders. The rods have a slow up-and-down motion; and, at the moment of change of direction, the platforms on one rod are opposite those on the other, so that the men can step from one to the other with ease and safety. In some there is a single moving rod, and one set of platforms is permanently fixed to the shaft timbering.

**Manes.** Souls of the departed, deified by the Romans.

**Manet,** EDOUARD, 1833–1883. French artist, one of the greatest of the impressionists. An important full-length portrait of his is in the Metropolitan Museum of New York.

**Manetho.** Egyptian priest of the 3d century B.C., who wrote a history of Egypt. The work as a whole is lost, but extracts have been preserved by Josephus and Eusebius. The list of royal dynasties handed down by the latter is still one of the main references for computations in Egyptian chronology.

**Manfred,** 1231–1266. Son of Frederick II.; regent of Italy 1250; king of the Two Sicilies 1258; conqueror of Tuscany 1260; defeated and slain at Benevento.

**Manfredi,** EUSTACHIO, 1674–1739. Italian lyric poet.

**Mangalore.** Port of s.w. India; taken by Hyder Ali 1763, by Gippoo Sultan 1784; held by the British since 1799. It has Lutheran and R. C. missions, and a large export trade. Pop. ab. 33,000.

**Mangan,** JAMES CLARENCE, 1803–1849. Irish poet and translator. *German Anthology*, 1845.

**Manganates.** Derivatives of manganic acid, $H_2MnO_4$.

**Manganese.** Mn. At. wt. 55, sp. gr. 7.5, sp.ht. .121, mpt. 1,500°–1,600° C. Discovered by Scheele 1774; white, shining metal, hard and brittle, oxidizing readily in moist air, decomposing water at 100° C., soluble in the common acids; widely distributed in nature, occurring in pyrolusite, braunite, manganite, etc. It forms four classes of compounds, showing a

valence of two, three, six, and seven. The most stable are the manganous compounds, in which it is bivalent. It is used in the manufacture of certain varieties of steel. The compound of manganese and carbon, similar to cast iron, melts at 1,200° C.

**Manganese,** METALLURGY OF. On smelting iron ores containing manganese minerals, in the blast furnace, the pig-iron produced contains manganese. When the proportion of manganese reaches 10 to 20 per cent, the iron breaks with large, flat, lustrous planes, and is called spiegeleisen. This is used in steel making, to introduce carbon and manganese into steel. Iron with 80 to 85 per cent of manganese has been made in blast furnaces, and is called ferro-manganese. It is used in making the soft varieties of steel. To obtain pure manganese, two methods are used. The chemical method, of Greene and Wahl, consists in dissolving pure manganese oxide in melted cryolite, and then adding metallic aluminium, which at once oxidizes, and sets free pure manganese. The operation is conducted in graphite crucibles lined with magnesite, and the manganese produced is nearly chemically pure, being particularly free from iron and carbon. The electrolytic method was used first by Bunsen, 1854, who electrolyzed an aqueous solution of manganese chloride by a very strong current. This method is very slow and expensive; a better way is to electrolyze a melted bath of cryolite in which manganese oxide has been dissolved, the manganese separating out as a crystalline powder. Besides its use in ordinary steel, Hadfield has described a manganese steel, containing 14 to 20 per cent of manganese, which is extremely hard and tough. Manganese bronze is an alloy of copper and manganese. Aluminium is hardened and strengthened by a small percentage of manganese.

**Manganese Dioxide.** $MnO_2$. It occurs in nature in fairly large quantities as pyrolusite, a black granular powder, used for making chlorine (see WELDON'S PROCESS) and oxygen, and for decolorizing glass, which would otherwise be green. The dioxide alone would give it an amethystine tint; this neutralizes the green of the glass, and it appears colorless.

**Manganese Ores.** The principal minerals that have a commercial value for the manganese they contain are the oxides: pyrolusite, $MnO_2$; braunite, $Mn_2O_3$, usually with a small percentage of silica; psilomelane, an amorphous mixture of manganese oxides with impurities; and manganite, $Mn_2O_3,H_2O$. The carbonate, rhodochrosite, $MnCO_3$, the silicate, rhodonite, $MnSiO_3$, and a few other manganiferous minerals are important in a smaller degree. Wad is an impure earthy mixture of manganese oxide with several other metallic oxides. Manganese ores are mined in Va., Ga., and Ark., but do not supply the demand in the U. S. The importations are chiefly from Russia, Cuba, Chili, and Japan.

**Manganese Sulphides.** When a solution of a manganous salt is treated with ammonium sulphide, a flesh-colored precipitate is formed, which is probably $Mn(SH)_2$,. On exposure to the air it becomes oxidized, thus forming MnS. Manganese disulphide, $MnS_2$, is also known; it occurs in nature as Hauerite.

**Manganic Chloride.** $MnCl_4$ Manganese tetrachloride. Unstable compound, probably formed when manganese dioxide is treated with hydrochloric acid. It decomposes into manganous chloride and chlorine.

**Manganic Oxide.** $Mn_2O_3$. Occurring in nature as the mineral braunite; made by heating the other oxides in oxygen.

**Manganite.** $Mn_2O_3,H_2O$. Hydrous manganese oxide found associated with other manganese ores.

**Manganites.** Salts derived from hydroxides of the formula $H_2Mn_2O_5$; $H_2Mn_5O_{11}$.

**Manganous Arsenate.** $Mn_3(AsO_4)_2+H_2O$. Brown needles, made by treating neutral sodium arsenate with a solution of manganous sulphate.

**Manganous Bromide.** $MnBr_2+4H_2O$. Small needles or monoclinic tablets; isomorphous with the corresponding chloride, and made by treating the dioxide with hydrobromic acid.

**Manganous Carbonate.** $MnCO_3$. It occurs in nature as manganese spar and dialogite, and is made artificially by treating a soluble manganese salt with a soluble carbonate. It is an amorphous, faintly-pink powder.

**Manganous Chloride.** $MnCl_2+4H_20$. Pink crystals, formed by treating manganese dioxide with hydrochloric acid.

**Manganous Fluoride.** $MnFl_2$. Amethyst-colored, crystalline powder, made by treating the carbonate with hydrofluoric acid.

**Manganous Hydroxide.** $Mn(OH)_2$. White precipitate, formed by adding a soluble hydroxide to a manganous salt. It is rapidly oxidized, upon exposure to the air, to manganic hydroxide.

**Manganous Iodide.** $MnI_2$. Rose-colored, leafy mass, obtained by treating manganous carbonate with hydriodic acid.

**Manganous Manganic Oxide.** $Mn_3O_4$. Made by heating other manganese oxides in the air. See HAUSMANNITE.

**Manganous Nitrate.** $Mn(NO_3)_2+6H_2O$. Colorless monoclinic crystals, made by dissolving the dioxide or carbonate in nitric acid and crystallizing from the acid solution.

**Manganous Oxide.** MnO. Formed by reducing a higher oxide by heating it in hydrogen.

**Manganous Sulphate.** $MnSO_4+5H_2O$. Pink crystals; when formed below 6° C. it contains $7H_2O$. It is made by treating the hydroxides or carbonates with sulphuric acid. It forms double sulphates with the alkaline sulphates; *e.g.*, $K_2SO_4$-$MnSO_4+6H_2O$.

**Manganous Phosphate.** $Mn_3(PO_4)_2+3H_2O$. Occurring in nature as REDDINGITE (q.v.); small lustrous crystals, obtained by boiling manganous carbonate with phosphoric acid.

**Mange.** Itch of dogs, horses, and cattle, caused by the irritation of the skin by minute parasites or acari. The parasite is destroyed by cleanliness and the persistent application of a weak solution of corrosive sublimate, sulphur, or mercurial ointment.

**Mangel-Wurzel.** Variety of BEET (q.v.); *Beta vulgaris.*

**Mango.** *Mangifera indica.* Tall tree of the natural family

Common Mango (*Mangifera indica*).

*Anacardiaceæ*, native of s. Asia; introduced into Tropical America; planted and esteemed for its large edible fruit.

**Mangosteen.** *Garcinia mangostana.* Small tree of the natural family *Guttiferæ*, native of the East Indies; planted and highly esteemed for its delicious fruit, which is reddish, pulpy, and the size of an apple.

**Mangrove.** Small trees of the genera *Rhizophora* and *Avicennia*, natives of all tropical regions, forming dense thickets

Mangrove Swamp.

along the sea-coasts, and producing a great abundance of aërial roots from the branches and lower parts of the trunks.

**Mangum,** WILLIE PERSON, 1792–1861. M.C. from N. C. 1823–26. U. S. Senator 1831–36 and 1840–53.

**Manhattan.** Island on which New York City is built. The Indians who lived in this region are called in some early documents Manatthans or Manhattoes. 14 m. long by 2¼ m. wide.

**Manhattan College.** In New York City; founded as a R.C. school 1853; enlarged and chartered 1863. It has academic, scientific, and technical courses, and is affiliated with several R. C. colleges in N. Y. and elsewhere.

**Manhole.** Vertical hollow shaft of brick or stone, by which access to a sewer can be had; on the surface of the street it is protected by a perforated cover of iron. Manholes are especially useful for the ventilation of the sewer. See HANDHOLE.

**Mani,** or MANES, ab. 215–277. Founder of Manichæism; crucified in Persia.

**Manichæism.** Widespread and long-enduring religion, which grafted Christian, Zoroastrian, and even Buddhist tenets on the Babylonian religion of nature. Knowledge was its idea of redemption. It had two classes, the "perfect" and the "hearers"; the former ascetic. Its belief in two original and eternal principles, good and evil, may have arisen among the Parsees, but owed its extended acceptance to Mani.

**Manila,** or MANILLA. Capital of the Spanish settlements in the Philippine Islands, a seaport of much importance on s.w. coast of Luzon. Pop., including suburbs, near 300,000, of whom 15,000 are Europeans.

**Manilius,** MARCUS. Latin poet of 1st century. His *Astronomica*, in five books, was pub. 1472 and tr. 1697.

**Manilla Rope.** The ultimate tensile strength in pounds may be found approximately by multiplying the square of the circumference in inches by 700. This is made of manilla hemp. See ABACA.

**Manin,** DANIELE, 1804–1857. Italian patriot, Pres. Venetian Republic 1848–49; thenceforth in Paris.

**Man in the Moon.** The notion that the moon is inhabited by a man with a bundle of sticks is common in n. Europe, some saying that he was found by Moses gathering sticks on the Sabbath, and doomed to reside in the moon. Another favorite idea is that he was a man caught stealing vegetables. He is frequently represented with a dog, and sometimes with a lantern. In classical myth, it is Endymion who is seen in the moon. The Egyptians represented the moon as little Horus in the womb of Isis. The Hindus associated an old man and a hare with the lunar planet. The Chinese claim to see a rabbit pounding rice.

**Manipur.** State n.w. of Burmah, governed by its rajah under British protection. Area 7,600 sq. m.; pop. ab. 225,000.

**Manis.** See PANGOLINS.

**Manissa,** or MANISA. Anciently MAGNESIA (q.v.), in w. Asia Minor. Pop. ab. 50,000.

**Manistee.** Capital of Manistee co., Mich., on Lake Michigan and Manistee River. Pop., 1890, 12,812, since largely increased.

**Manitoba.** Province of the Dominion of Canada, adjoining Minn. and Dakota; Hudson's Bay Co.'s territory till 1868. The

Harvest time in Manitoba.

Riel insurrection occurred here 1869–70; capital, Winnipeg. Area, ab. 74,000 sq. m. Pop., 1891, 152,506.

**Manitoba Lake.** In Manitoba; area ab. 1,800 sq. m.

**Manitou.** Any object reverenced by American Indians; under Jesuit teachings, the Deity.

**Manitoulin Islands.** Between Lake Huron and Georgian Bay. Three belong to Canada, one to Mich.

**Mann,** HORACE, LL.D., 1796–1859. Sec. Mass. Board of Education 1837–48; M.C. from Mass. 1849–53; pres. Antioch Coll., O., from 1852. By his *Reports*, 1837–48, and otherwise, he did much for school reform.

**Mann,** MATTHEW DERBYSHIRE, M.D., b. 1845. Prof. Buffalo. *Gynæcology*, 1887.

**Mann,** WILLIAM JULIUS, D.D., 1819–1892. Lutheran pastor in Phila. 1850–84; prof. theol. sem. from 1864. *Life of H. M. Muhlenberg*, 1887.

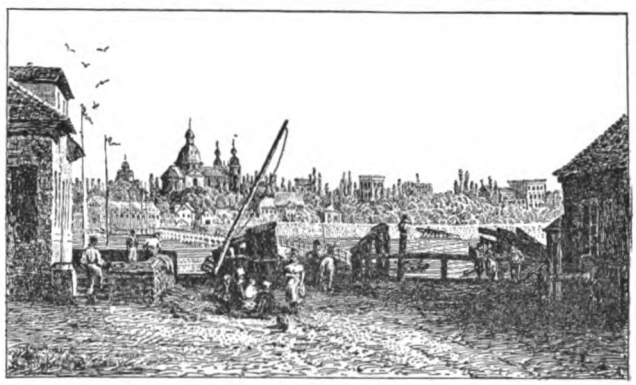
**Manna.** Sweet substance produced by *Fraxinus ornus*, Manna Ash, native of s. Europe; obtained by wounding the stem and allowing the sap to harden. The Manna of Scripture was a different substance, probably an exudation from desert plants in the region through which the Israelites passed.

**Manna Grass.** Grasses of the genus *Panicularia*, natives of swamps and bogs in the n. hemisphere.

**Manners,** JOHN JAMES ROBERT, LL.D., b. 1818. M.P. 1841; member of several cabinets; Duke of Rutland 1887.

**Mannhardt,** JOHANN WILHELM EMANUEL, 1831–1880. German ethnologist.

**Mannheim.** City of Baden, at the junction of the Rhine and Neckar; razed by the French 1689; attacked by Austrians



Mannheim.

1795. It is a modern town, with a large trade. Pop., 1890, 79,058.

**Mannheim Gold.** Brass containing 20 per cent zinc and 80 per cent copper.

**Manning,** DANIEL, LL.D., 1831–1887. Ed. Albany *Argus* 1865; U. S. Sec. Treasury 1885.

**Manning,** HENRY EDWARD, D.D., 1808–1892. Archdeacon of Chichester 1840; admitted to R. C. Ch. 1851; Abp. of Westminster 1865, Cardinal 1875. *Vatican Decrees*, 1875.

**Mannite.** $C_6H_8(OH)_6$. Mpt. 166° C. White crystalline substance, found quite widely distributed in the vegetable world. It is an alcohol, and constitutes most of the manna of trade, prepared from the dried juice of the manna ash. It is found in celery, in rye bread, and can be made from glucose by the addition of hydrogen. It has a sweetish taste, and with nitric acid furnishes the powerful explosive nitro-mannite.

**Manoel do Nascimento,** FRANCISCO, 1734–1819. Portuguese poet and translator, in France from 1778.

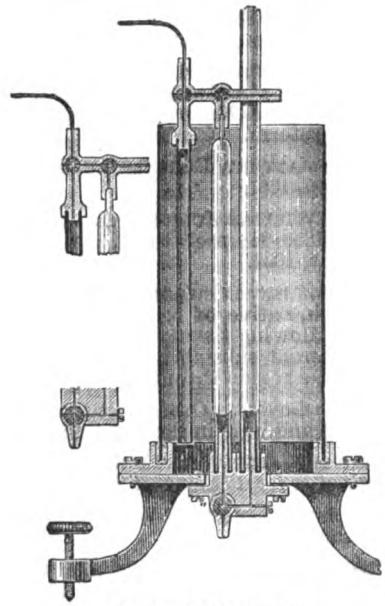
**Man-of-the-Earth.** *Ipomœa pandurata*. Trailing, white-flowered vine of the Morning Glory family, native of the s.e. U. S., producing a huge root; called Wild Potato-vine.

**Man of War.** In s. Staffordshire coal mines, pillar of coal left standing at some point of special danger.

**Manometer.** Instrument for measuring the pressure of a fluid. The unit usually employed is called an ATMOSPHERE (q.v.). The instrument consists of a vertical U tube, open at both ends (open-air manometer), or closed at one end (compressed air). In the former case the pressure is measured by the length of the column of mercury it will sustain; *i.e.*, 76 cm. or 29.9 in. for each atmosphere. The closed manometer may consist of a straight tube containing air, the open end dipping

under the surface of mercury in a small closed cistern, which may be connected with the source of pressure. The action is founded on Boyle's law. The pressure, being applied to the

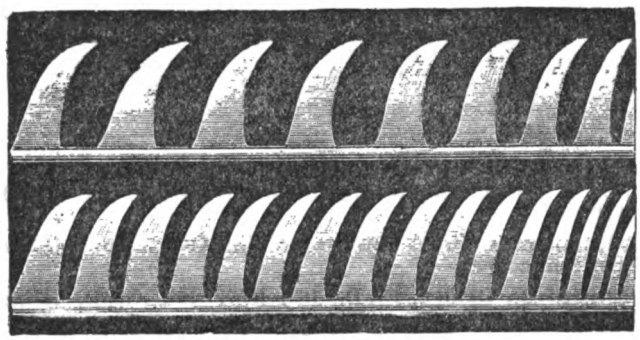
Mercury Manometer.



Regnault's Manometer.

surface of mercury in the cistern, forces it up the tube, thus compressing the air; the pressure applied is always inversely proportional to the volume of the inclosed air. See GAUGE.

**Manometric Flames.** Koenig of Paris has constructed several forms of apparatus in which the variations of pressure produced by air vibrations are rendered evident to the eye by their effect upon minute gas flames. If a small jet burn from an aperture on one side of an elastic membrane while the other side is in contact with a column of air vibrating under the



Manometric Flames.

influence of the voice or other musical sound, the variations of pressure in the gas supply will cause the flame to vibrate. Now, if the image of the flame be viewed in a rapidly revolving mirror, the image will be drawn out into a horizontal band, the upper edge of which will be serrated and will graphically represent the different sounds in all their characteristics.

**Manor System.** Mode of land tenure and social organization which prevailed in most countries of central Europe during the Middle Ages, and later. It arose from the growth of feudal institutions on the communal or the Roman substratum of earlier times; and consisted in the predominance of the lord of the manor, limited by concurrent rights, agrarian and jural, belonging to the tenants of the manor.

**Manrique,** JORGE, 1420–1485. Spanish elegiac poet. His *Coplas*, 1476, is familiar in Longfellow's version, 1833.

**Mans,** LE. Old city of France, on the Sarthe, 132 m. w.s.w. of Paris. Here Republicans slaughtered Vendeans Dec. 10, 1793, and Germans defeated Frenchmen Jan. 11, 1871.

**Mansard Roof,** or CURB ROOF. Formed of four contiguous planes externally inclined to each other, the ridge being in the line of concourse of the two middle planes and the highest of the three lines of concourse. The advantage over other roofs is that it gives more space.

**Mansart,** NICOLAS FRANÇOIS, 1598–1666. Parisian architect, inventor of the Mansard roof.—His grand-nephew, JULES HARDOUIN, 1646–1708, ennobled 1683, planned the palace at Versailles and other important buildings.

**Manse.** Dwelling provided for a settled minister of Ch. of Scotland; necessary appendage of every parish.

**Mansel,** HENRY LONGUEVILLE, D.D., 1820–1871. Prof. Oxford 1859; Dean of St. Paul's, London, 1868. His *Limits of Religious Thought*, 1858, applied Sir W. Hamilton's ideas, which he defended in *Philosophy of the Conditioned*, 1866; *Prolegomena Logica*, 1851; *Metaphysics*, 1857–60; *Gnostic Heresies*, 1874. As a metaphysician he maintained a sort of theological agnosticism, which Spencer adopted for the ultimate postulates of science.

**Mansfeld,** PETER ERNEST I., COUNT, 1517–1604. Gov. of Luxemburg; prominent in the Spanish service.—His son and namesake, 1580–1626, leader of free-lances, defeated Tilly, April 1622, at Wiesloch, and was overthrown by Wallenstein at Dessau, April 25, 1626.

**Mansfield.** Capital of Richland co., Ohio. Pop., 1890, 13,542.

**Mansfield,** BATTLE OF. In La. See SABINE CROSS ROADS.

**Mansfield,** EDWARD DEERING, LL.D., 1801–1880. Journalist and statistician in Ohio; biographer of Gens. Scott and Grant.

**Mansfield,** JOSEPH KING FENNO, U.S.A., 1803–1862. Major-gen. U. S. Vols. 1862; killed at Antietam.

**Mansfield,** RICHARD, b. 1857. English actor, known in U. S. since 1878; most eminent as Dr. Jekyll and Mr. Hyde.

**Mansfield,** WILLIAM MURRAY, EARL OF, 1705–1793. M.P. and Solicitor-gen. 1743; Atty.-gen. 1754; Chief-justice of King's Bench 1756–88; Baron 1756, Earl 1776; systematizer of mercantile law; attacked by Junius, and raided in the Gordon riots, 1780.

**Mansfield,** MT. E. of Burlington, Vt.; highest peak of the Green Mts.; noted for its extensive view. Altitude 4,430 ft.

**Mansfield College.** At Oxford, Eng. Congregational school of theology, founded 1886.

**Mansilla de Garcia,** EDUARDA, b. 1838. Writer on Argentine customs and history. *El Medico de San Luis*, 1857; *Lucia Miranda*.

**Mansion House.** Residence of Lord Mayor of London; erected 1739; scene of many entertainments and activities.

**Manslaughter.** Felonious homicide, resulting from sudden heat of passion without intent to kill. Its degrees and punishment are regulated by modern statutes.

**Manson,** GEORGE, 1850–1876. Scottish painter.

**Mant,** RICHARD, D.D., 1776–1848. Bp. of Killaloe 1820, of Down and Connor 1828, with Dromore added 1842. He pub. with G. D'Oyly, a well-known *Annotated Bible*, 1814. *Bk. of Common Prayer, with Notes*, 1820; version of the Psalms, 1824; *Ancient Hymns*, 1837; *Hist. Ch. of Ireland*, 1839–41. Several of his original hymns are widely used.

**Mantegna,** ANDREA, 1431–1506. Leading painter of the Paduan school; distinguished for scientific accuracy in anatomy and perspective. His style is otherwise somewhat rigid. He has fine frescoes in the Church of the Eremitani, at Padua, and at Mantua, at Hampton Court, nine pictures of the *Triumph of Cæsar*, and fine oil paintings in London, Paris, and Milan. His best altar piece is in San Zenone, at Verona.

Judith, by Mantegna.

**Mantell,** GIDEON ALGERNON, 1790–1852. Geologist of Lewes, Sussex, who formed a collection of its fossils, now in the British Museum. Most important discoveries sprang out of his researches in the strata of Wealden formation: to him we owe the discovery and demonstration of Iguanodon and its colossal allies. *Fossils*, 1822–26; *Wonders of Geology*, 1833; *Medals of Creation*, 1844.

**Manteuffel,** EDWIN HANS KARL, FREIHERR VON, 1809–1885. Prussian general, dis-

tinguished in the wars with Austria and France, 1866–70; Field-marshal 1873; Gov. of Alsace-Lorraine 1880.

**Mantidæ.** Gressorial *Orthoptera*, with the anterior pair of legs adapted for catching insect-prey. The tibia and femur of this pair are toothed, and the former is held folded against the latter in an attitude as of prayer. They live in hot countries. *Mantis* is the type-genus.

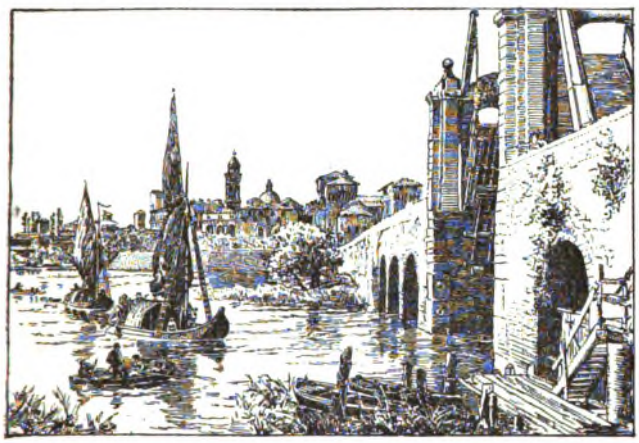
**Mantinea.** City of Arcadia, where Epaminondas fell, defeating the Spartans 362 B.C.

**Mantiqueira.** Mountain chain in Brazil parallel to the coast and ab. 60 m. from it.

**Mantissa.** Decimal part of a common logarithm, corresponding only to the figures in sequence. .301030 is that of the logarithm of 2; its order in the decimal scale must be known from an integer CHARACTERISTIC (q.v.). 1.301030=log 20 or two tens: while $\bar{1}$.301030=log 2 or two tenths.

**Mantle.** Pallium; fold of skin which grows around the body of Mollusks, and secretes the shell, which it lines on the inside as a loose skin. In cuttlefishes it is naked.

**Mantua.** Fortified city of n. Italy, on two islands of the Mincio; founded by Etruscans; birthplace of Virgil; governed



View of Mantua from the Bridge of San Giorgio.

by dukes 1328–1708; held by Austria 1708–97 and 1814–66; noted for its mediæval buildings. Pop. ab. 28,000.

**Manual Training.** Education of the hand and eye in material processes, such as wood and metal working, plastic modeling, and drawing. See INDUSTRIAL SCHOOLS and INDUSTRIAL TRAINING.

**Manubrium.** Proboscis of Jelly-fishes, at the end of which is the mouth. It hangs in the center of the subumbrellar cavity.—In Botany, cylindrical cell attached to the center of the inner surface of each shield of the antheridium in *Characeæ*.

**Manuel,** JUAN, 1282–1349. Spanish prince, poet, and writer of tales. *Conde Lucanor*.

**Manuel I.,** COMNENUS, 1122–1180. Byzantine emperor 1143; vigorous ruler, almost constantly at war.

**Manuel II.,** PALÆOLOGUS, 1348–1425. Emperor 1391; brave and capable defender of a tottering throne, a shrunken domain, and a city besieged 1392 and 1423 by Turks.

**Manure.** Fertilizers composed of animal excrements mixed with litter and absorbents. It is subject to loss by fermentation, which dissipates the nitrogen into the air in the form of ammonia, and by leaching of the more readily soluble parts. Inert absorbents serve to take up the liquid parts and help to check fermentation, which may be further checked by closely packing the mass, thus excluding the air. Protection from rain is necessary to prevent leaching of soluble elements of fertility. Average barnyard manure contains water 69 per cent, nitrogen 0.49, potash 0.43, phosphoric acid 0.32.

**Manutius,** ALDUS, 1450–1515. Founder of the Aldine Press at Venice, 1490. Under him and his sons some of the earliest printed books and the first editions of many classical authors were published. First vol. of his Aristotle was issued 1495.

**Manway.** Small or narrow passage left open as a means of communication between different parts of a mine.

**Manx.** Celtic dialect, long used on the Isle of Man, and not yet extinct.

**Manynema.** Negro tribe in Central Africa, w. of Lake Tanganyika, near Lualaha (the upper Congo), noted among Africans for their beauty. They are honest, agricultural and hold markets at regular seasons. They are cannibals, but eat only enemies taken in war: women are excluded from the orgies. They acknowledge a good and an evil spirit. North of these are true cannibals, among whom Dr. Livingstone found no trace of religious ideas. East of these tribes are the Waganda, forming a monarchy of 5,000,000 subjects. The men go entirely naked. Further north, among the Mountains of the Moon, is a tribe noted for the white complexion and beauty of its women.

**Manyplies.** See SELENODONTIA.

**Manzoni,** ALESSANDRO, 1785–1873. Italian poet, dramatist, and novelist, best known by his romance, *I Promessi Sposi* (The Betrothed), 1825–27.

**Maori.** Natives of New Zealand, of mixed Polynesian, Malay, and Melanesian elements. They are supposed to have come ultimately from the Samoan group of islands ab. 1400. When discovered by Capt. Cook, they stood highest in character and intelligence of all the Pacific races, but polygamy, canni-

Maori of New Zealand Equipped for Fighting.

balism, and gross festivals existed among them. The aristocrats were always highly tattooed. They are now Christianized, are successful farmers and traders, participate in the colonial parliament, and have schools whose pupils can take the prizes from English students: they are diminishing. In 1891 they numbered 41,993.

**Map.** Representation in plan of the whole or part of the earth's surface, made as if the point of sight were directly over all parts of the surface. The scale is the proportion its dimensions bear to the country it represents. There are many classes of maps, general and special, which bear names descriptive of their purpose. Topographic maps are primarily for showing the relief, by hachures, and, in recent years, by contours, and are properly upon somewhat large scales. They show also hydrography and culture. Chorographic maps are topographic maps of large areas, upon small scales. Hydrographic maps or charts aim to illustrate the streams, lakes, seas and other bodies of water. There are culture maps in great variety, for showing railroads, post-routes, roads, boundaries, etc., besides geological, statistical, faunal and floral maps.

**Map,** MILITARY. Drawing in horizontal projection of a region over which army operations may extend, giving in sufficient detail the principal features, as roads, streams, villages, woods, contours, etc., so that the commanding officer would be able to direct a march or plan a battle from the information derived from its study.

**Map,** or **Mapes,** WALTER, ab.1143–ab.1210. Archdeacon of Oxford 1196; satirical poet and romancer. *Goliæ; Lancelot of the Lake; Holy Graal.*

**Maple.** Forest trees and shrubs of the genus *Acer*, natural family *Aceraceæ*, natives of the n. hemisphere. *A. saccharum* of e. N. America is the Sugar Maple, also called Rock Maple; the common Red Maple is *A. rubrum*. There are numerous species in Japan. See ACER CAMPESTRE.

**Mapleson,** JAMES HENRY, b. 1832. English operatic manager, well known in U. S. since 1878.

**Maquet,** AUGUSTE, 1813–1887. French novelist and dramatist, assistant of the elder Dumas.

**Marabouts.** Devotees of Africa, much reverenced by Mohammedans, and troublesome to the French in Algeria.

**Maracaybo.** City of Venezuela, on the outlet of Lake M.; founded 1568. The lake, discovered 1499, covers ab. 8,400 sq. m., and is connected with the Gulf of M., an inlet of the Caribbean Sea. Pop., 1888, 34,284.

**Marah.** Bitter spring in the wilderness, sweetened by Moses. Ex. xv. 23–25.

**Marajo.** Brazilian island at the mouth of the Amazon. Area ab. 10,000 sq. m.

**Maranhao,** or MARANHAM. Seaport of Brazil, on an island at the mouth of the M. Pop. ab. 38,000.

**Maranon.** Upper Amazon, within the Andes.

**Maraschino.** Liqueur made from the fermented and distilled juice of the Marasca cherry, grown in Dalmatia; this is flavored with rose and orange flower water and sweetened with sugar. It contains 120 gns. sugar per oz. and 37 per cent alcohol. The best comes from Zara, Dalmatia.

**Marasmus.** Synonym for general ATROPHY (q.v.). Emaciation, affecting both mental and physical forces.

**Marat,** JEAN PAUL, 1744–1793. Swiss physician in London and Paris; founder of the journal *L'Ami du Peuple*, 1789–93, which became a terrible power in exciting the passions of the

Jean Paul Marat.

rabble; member of Convention, and pres. Committee of the Commune; stabbed by Charlotte Corday. At first regarded as a martyr, his memory soon came to be execrated.

**Marathon.** Village and plain on e. coast of Attica, 22 miles n.e. of Athens; scene of battle between Persians and Athenians 490 B.C.

**Maratta,** CARLO, 1625–1713. Italian painter, of the Roman school, whose works are externally pleasing but essentially weak and sentimental. After making allowances for the usual traits of the decadence period, he must still be assigned a low rank among its artists. He was best in portraits, of which a fine example is in the Metropolitan Museum of New York.

**Marattiaceæ.** Family of tropical ferns, comprising but few species.

**Marauder.** One who under cover of his military employment plunders and offers violence to civilians. In a disciplined army, he is punishable by death.

**Maravedi.** Smallest Spanish copper coin, minted 1474–1848.

**Marbach,** JOHANN, 1521–1581. Lutheran pastor at Strassburg 1546, where he remodeled the ritual and drove out the Reformed.

**Marbach,** LEAGUE OF. See SUABIA.

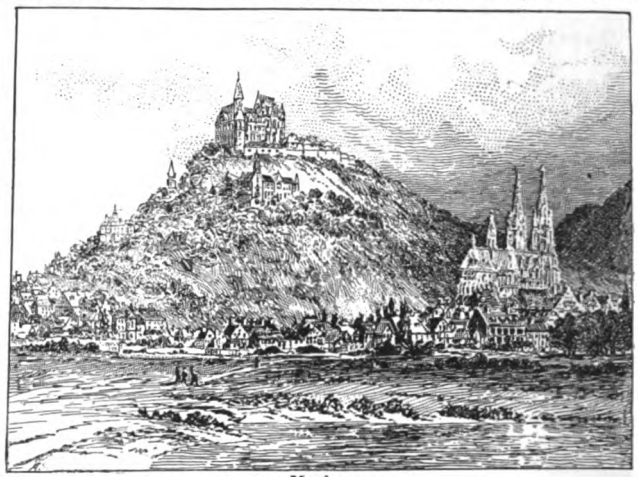
**Marbeck,** or **Merbecke,** JOHN, d. ab.1585. Organist at Windsor, composer and theological writer.

**Marble.** (1) Crystalline granular limestone that will take a high polish; (2) other ornamental stones capable of receiving a polish, as serpentine marble. In commerce marbles are often named from some peculiarity of color or marking, from the uses to which they are to be put, or from the localities where they are quarried. The annual marble product of the U. S. is ab. 3,500,000 cubic feet, valued at $3,800,000. See CALCIUM CARBONATE.

**Marble,** MANTON, b. 1835. Ed. N. Y. *World* 1862–76.

**Marbles.** Boys' sport, derived from ancient game played with round stones; the present methods and material are essentially modern. The term marble indicates the commoner sort of the round, hard clay sphere: the colored and more elaborately marked are called Alleys and Agates; many are of colored glass. An almost infinite variety of games are played with marbles, involving the throwing of them at others or shooting them by means of the bent thumb and finger along the ground. Each locality has its especial games and local names.

**Marburg.** Ancient town of Nassau, seat of a university, founded 1527. Here a conference was held, Oct. 2–5, 1529, between the German and Swiss reformers, who agreed on all



Marburg.

essentials except the Real Presence in the Eucharist; Luther refused Zwingli's offered hand. The M. Bible, pub. 1712, was Luther's, revised with notes. Pop. 1891, 14,520.

**Marcantonio,** or RAIMONDI, d. ab.1534. Italian engraver.

**Marcasite.** $FeS_2$. Sulphide of iron, identical in chemical composition with pyrite, and strongly resembling that mineral in many physical properties. It is orthorhombic in crystallization, and has a slightly lower specific gravity than pyrite. It easily suffers decomposition on exposure to the weather, and therefore is an objectionable ingredient in a building stone.

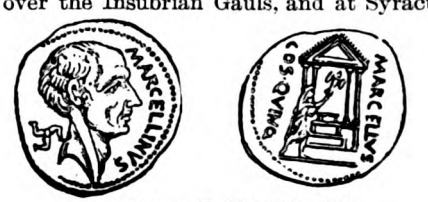
**Marceau,** FRANÇOIS SÉVERIN DES GRAVIERS, 1769–1796. French general, distinguished in La Vendée and Germany; killed at Altenkirchen.

**Marcellinus.** Bp. of Rome 296–305. Under persecution he offered incense on a heathen altar, but later saw his error and laid down his life.

**Marcello,** BENEDETTO, 1686–1739. Venetian poet and musician. His most celebrated work is the setting to music Italian paraphrases of the first fifty psalms. He also composed an opera, a pastorale, some instrumental pieces and madrigals, and wrote a satire, *Il teatro alla moda.*

**Marcellus.** Bed of black shale in the lower part of the Devonian system in e. N. America. See DEVONIAN.

**Marcellus,** MARCUS CLAUDIUS, d. 208 B.C. Five times consul; victor over the Insubrian Gauls, and at Syracuse, which




Coin of Marcus Claudius Marcellus.

he took 212 B.C., after besieging it two years; killed in battle with Hannibal. One of his descendants, 43–23 B.C., was Augustus' nephew, son-in-law, and intended successor.

**Marcellus I.** Bp. of Rome 307–309.—II. Marcello Cervini, pope 1555.

**Marcescent.** Corolla of plants when it withers or dries without falling away from the calyx, as in Heather.

**Marcet,** MRS. JANE, 1769–1858. Swiss-English author of *Conversations on Chemistry*, on *Political Economy*, 1817, *Nat. Philos.*, 1819, and *Botany*.

**March,** or MORAVA. River of Moravia, which joins the Danube 6 m. e. of Presburg. Length 214 m.

**March,** AUZIAS, d. ab. 1459. Spanish poet.

**March,** FRANCIS ANDREW, LL.D., b. 1825. Prof. Lafayette Coll., Easton, Pa., since 1856; writer on philology; ed. sundry text-books. *Anglo-Saxon Grammar*, 1870.

**Marchand's Actinometer,** or PHOTANTITYPIMETER. Solution of one equivalent of perchloride of iron and one equivalent of oxalic acid in water exposed to the sunlight, whereby carbonic acid gas is set free, the measurement of whose volume expresses the chemical activity of the sun's rays.

**Marchantiaceæ.** Family of Liverworts, including most of the larger thallose species.

**March.** First month of the Roman year, named after their god Mars. In England, till 1752, the legal year was reckoned to begin with the 25th of March. The last three days are popularily supposed to have been borrowed from April and are proverbially stormy.

**March,** IN MUSIC. Broadly stated, a composition designed for the regulation of the movements of large numbers of persons, such as military bodies, ceremonial processions and the like. As such the term is also properly applied to certain dances in which there is a steady forward movement in orderly ranks, such as the Polonaise (see POLISH MUSIC) and the Intrada. As a musical form the military march cannot be traced back beyond the middle of the 17th century, but it is obvious that its rhythms were already employed to secure orderly movement by the ancients. In artistic music the earliest examples are found in the operas and Clavier compositions of the 18th century, and they indicate their origin to have been in vocal music. The march is ordinarily written in common time, at a speed calling for 75 pulsations or steps per minute. Like the minuet and other old dances it has a second part called a Trio, from the fact that it was once a custom to write the part for three voices or instruments. Marches receive designations according to the purposes to which they are put, such as Quickstep, Funeral March, Wedding March, Triumphal March, etc.

**Marches.** Regions on the English borders of Scotland and Wales, scenes of frequent conflicts in past ages.

**Marchetti,** FILIPPO, b. 1835. Italian composer of operas. *Ruy Blas*, 1869.

**Marchfeld.** Plain near Vienna, where Rudolph of Hapsburg defeated Ottocar II. of Bohemia, Aug. 26, 1278; and the Austrians won a bloody and fruitless victory, May 21–22, 1809. The latter, known as the battle of Aspern, was Napoleon's first repulse in Germany.

**Marchiafava,** ETTORE, b. 1847. Italian pathologist. He is particularly known by his studies of the ætiology of malaria.

**Marcion.** Heresiarch of 2d century, commonly, though not quite accurately, accounted a Gnostic. He rejected the Hebrew Scriptures, and pushed asceticism to its extreme limits. His exalted conceptions would not allow Christ to be rooted in humanity or the Gospel in history. His sect faded out ab. 500.

**Marcomanni.** German nation or league, who invaded Pannonia ab. 166, warred with the Romans, and crossed the Alps 270.

**Marco Polo.** See POLO, MARCO.

**Marcou,** JULES, b. 1824 in France. Assistant in the Mineralogical department of the Sorbonne 1846, and of the Jardin des Plantes 1847. He traveled with Agassiz in the Lake Superior region; pub. a geological map of the U. S. and Canada 1853; became Prof. of Geology at Zurich 1859, and curator of Paleontology in the Museum of Comparative Zoölogy, at Cambridge, 1861.

**Marcus.** Bp. of Rome Jan.–Oct. 336.

**Marcus Aurelius Antoninus.** See ANTONINUS.

**Marcy,** HENRY ORLANDO, b. 1837. American surgeon, serving during the Civil War. *Anatomy and Surgical Treatment of Hernia*, 1892.

**Marcy,** RANDOLPH BARNES, 1812–1887. Brig.-gen. in the U.S.A., serving in the Mexican and Civil wars. *Exploration of the Red River in 1852*, 1853; *Prairie Traveler*, 1859; *Personal Recollections*, 1866.

**Marcy,** WILLIAM LEARNED, 1786–1857. Associate-justice N.Y. Supreme Court 1829; U. S. Senator 1831–33; Gov. of N. Y. 1833–39; Sec. of War 1845–49; Sec. of State from 1853–57. His sympathies were with the anti-slavery Democrats.

**Marcy,** MOUNT, or TAHAWUS. Highest of the Adirondacks; in Essex co., N. Y. Altitude 5,379 ft.

**Mardi Gras.** See SHROVETIDE and NEW ORLEANS.

**Mardonius,** d. 479 B.C. Persian general; son-in-law of Darius Hystaspes. Sent by Darius against Athens 492 B.C., he lost his fleet off Mount Athos, and most of his land forces in Thrace. After battle of Salamis, 480, he was left by Xerxes to conquer Greece, but was defeated and slain at Platæa.

**Maréchal,** PIERRE SYLVAIN, 1750–1803. French poet and polemic, noted for his diatribes against religion. With Lalande he pub. *Dict. des Athées*, 1800.

**Mare Island.** In Solano co., Cal.; important for its navy yard.

**Marek,** JAN JINDRICH, 1801–1853. Bohemian novelist and poet. *The Quack*, 1846.

**Maremma.** Malarious marshes on the w. coast of Italy, chiefly in Tuscany, in area ab. 1,000 sq. m.; developed in the Middle Ages; partly drained since 1825; farmed in summer, with much sacrifice of life.

**Marenco,** CARLO, 1800–1846. Italian dramatist.—His son, LEOPOLDO, b. 1831, is a dramatist and poet.

**Marengo.** Village of n. Italy, near Alessandria. Here Bonaparte defeated an Austrian army, June 14, 1800, and became master of Italy.

**Marenhölz-Bülow,** BERTHA, BARONESS VON, b. 1816. Founder of kindergartens in Germany and elsewhere; writer on Froebel's system.

**Marenzio,** LUCA, ab. 1555–1599. Italian composer, noted for his madrigals; organist of the papal chapel in Rome.

**Mareotis.** Marsh on the Nile delta, s. of Alexandria; once a lake, long a sandy plain; brought to its present state by belting dikes 1801 and later.

**Mare's Tail.** *Hippuris vulgaris.* Erect aquatic plant of the natural family *Halorageæ*, native of the cooler portions of the n. hemisphere and of Patagonia.

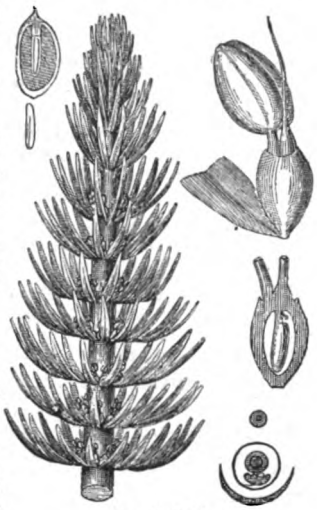
**Mare's Tail.** Delicate forms of cirrus clouds.

**Maret,** HUGUES BERNARD, 1763–1839. French diplomatist, Sec. of State 1804, Foreign Minister and Duke of Bassano 1811; in exile 1815–30.

**Maretzek,** MAX, b. 1821. German composer, conductor and operatic manager, in New York from 1848.

**Marey,** ÉTIENNE JULES, b. 1830. Prof. Coll. de France 1869. *Animate Mechanism*, tr. 1874; *Physiologie Experimentale*, 1875–80; *Vol des oiseaux*, 1890.

**Marfori,** CARLOS, 1818–1892. Spanish courtier and official, patronized by Isabella II., and a principal cause of her downfall 1868.



Mare's Tail.

**Margaret,** ST., ab. 1046–1093. Queen of Malcolm Canmore 1069; of the blood royal of Alfred; civilizer and practical Christianizer of Scotland; canonized 1251.

**Margaret,** 1353–1412. Daughter of Waldemar IV. of Denmark; wife of Hakon VIII. of Norway; Regent 1375, Queen 1387; conqueror of Sweden. The three kingdoms were conjoined by the Union of Calmar, 1397.

**Margaret of Anjou,** 1429–1482. Daughter of René of Provence; wife of the feeble Henry VI. of England 1445, and much more king than he; heroine of the Wars of the Roses; twice in exile; imprisoned 1471–75.

**Margaret of Navarre,** 1492–1549. Sister of Francis I.; Queen of Navarre 1527, and grandmother of Henry IV.; author of the *Heptameron*, pub. 1558, a series of seventy-two tales on the plan of Boccaccio's *Decameron*; but less coarse. *Marguerites* (poems), 1547; *Lettres*, pub. 1842–43; *Dernières Poésies*, 1896.

**Margaret of Parma,** 1522–1586. Daughter of Charles V.; mother of Alexander Farnese; regent of the Low Countries

Margaret of Parma.

1559–67. The struggle for independence grew from the discontents of this time, and assumed definite character under Alva, her successor.

**Margaret of Valois,** 1552–1615. Daughter of Henry II.; wife of Henry of Navarre 1572–99. Their union was a futile measure of state, and they soon separated. Her *Lettres* and *Memoires* were pub. 1842.

**Margaric Acid.** Mpt. 599° C. Obtained from fats; proved to be a mixture of palmitic, stearic and oleic acids. Artificially, it is made by boiling cetyl cyanide with caustic potash. It closely resembles palmitic acid.

**Margarine.** See OLEOMARGARINE.

**Margarita.** Island n. of Venezuela, discovered 1498. Area ab. 440 sq. m.; pop. ab. 40,000.

**Margarite.** Pearl mica; closely resembling common mica, but brittle instead of elastic, and somewhat harder; generally associated with corundum; a hydrous calcium-aluminium silicate.

**Margaritone,** d. ab. 1290. Italian painter, architect, and sculptor.

**Margary,** AUGUSTUS RAYMOND, 1846–1875. English traveler, killed in China. *Journal*, 1876.

**Margate.** English watering-place, in the Isle of Thanet, Kent. Pop., 1891, 21,369.

**Margelidæ.** Family of *Antho-Medusæ*, including jelly-fish having four or more mouth-tentacles, either simple or branched, four or eight separated reproductive glands, in the radii of the stomach wall, and with simple tentacles, sometimes grouped into four or eight bundles.

**Marginal Utility.** In Economics, degree or amount of that to which it is applied (utility, return, etc.), being just sufficient to call forth the amount of effort necessary to produce it.

**Margin of Cultivation.** Condition of the least productive land in cultivation at any given time, considered as yielding no economic rent to its owners, and as being the standard by which the rent of more fertile land is measured.

**Margoliouth,** MOSES, 1820–1881. Polish-English writer on Jewish topics.

**Marguerite.** Several plants of the Composite family, including *Bellis perennis*, the Daisy, and *Chrysanthemum leucanthemum*, the Ox-eyed Daisy.

**Marguerite,** See MARGARET.

**Marheineke,** PHILIPP KONRAD, 1780–1846. Prof. of Theology at Erlangen 1805, Heidelberg 1807, and Berlin 1811. His works reflect the philosophy of Hegel. *Dogmatics*, 1819; *Hist. Reformation*, 4 vols., 1817–34.

**Maria Christina,** 1806–1878. Daughter of Francis I. of Naples; wife of Ferdinand VII. of Spain 1829; mother of Isabella II.; Regent 1833–40; expelled from Spain 1840, 1854, and 1868.

**Mariager,** PETER, b. 1827. Danish novelist and translator, writing on classical subjects.

**Maria Louisa,** 1791–1847. Daughter of Francis I. of Austria; second wife of Napoleon 1810; Duchess of Parma 1816; married to Count von Niepperg 1822.

**Mariana.** Grant of land made to John Mason 1621, between Salem River and the head of the Merrimack, in New England.

**Mariana,** or **Marianne,** ISLANDS. See LADRONES.

**Mariana,** JUAN DE, 1536–1623. Spanish Jesuit, prof. at Rome 1561–65, and at Paris 1569–74. His *De Rege*, 1599, justified the murder of kings and was condemned. His *Historiæ de Rebus Hispaniæ*, 1592–1609 (Spanish tr. 1601–7, Eng. 1699) is a classic.

**Marianus Scotus,** d. 1086. Monk of Fulda, teacher at Mentz and Ratisbon. His *Chronicon*, pub. 1559, extends to 1083.

**Maria Theresa,** 1717–1780. Daughter of Charles VII. and heir of his hereditary thrones by the Pragmatic Sanction. She succeeded him Oct. 21, 1740, giving her husband, Francis of Tuscany, equal share in the government. The monarchy was weak, exhausted, and surrounded with enemies; but the war of Austrian succession ended 1748 in her favor, though with the loss of Silesia, and her husband became Emperor of Germany. Her efforts for the prosperity of her people were interrupted by the Seven Years' War, 1756–63. On her husband's death, 1765, she gave military affairs into the hands of her son Joseph. She raised Austria from a low estate to power and prosperity.

**Mariazell.** Town in Austria, 60 m. s.w. of Vienna in a mountainous region. It is famous for its shrine and notable image of the Virgin, which attracts ab. 100,000 pilgrims annually. Pop. ab. 2,000.

**Marie Antoinette,** 1755–1793. Daughter of Maria Theresa; wife of Louis XVI.; victim of a false position and of outrageous slanders, as in the matter of the DIAMOND NECKLACE (q.v.) 1785. Her unpopularity helped to overthrow the throne, and after months of imprisonment and a frightful trial she was guillotined.

**Marie de France,** 13th cent. Poet and translator, apparently Norman-English. Her *Lais* were tr. 1872.

**Marie de Medicis,** 1573–1642. Daughter of Francis I. of Tuscany; second wife of Henry IV. of France 1600; mother of

Marie de Medicis.

Louis XIII.; Regent 1610–17; imprisoned 1617–19 and 1630–31. She encouraged the fine arts and built the Luxembourg palace.

**Marienbad.** Town in Austria 17 m. e.s.e. of Eger; in a valley frequented for its cold chalybeate and saline springs. Alt. 2,100 ft. Pop. ab. 3,000.

**Marieton,** PAUL, b. 1862. Provençal poet and biographer, chancellor of the Félibres.

**Marietta College.** At Marietta, O.; founded 1833, chartered 1835. It has 26 teachers, ab. 320 students and 50,000 vols. It is co-educational.

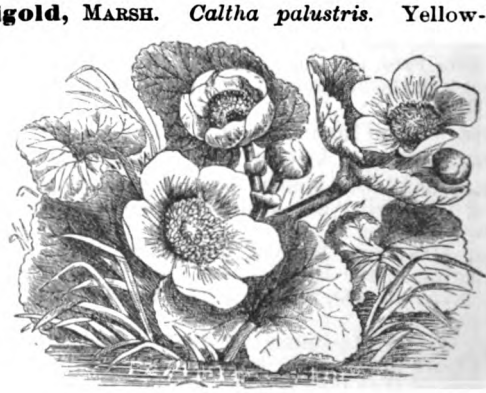
**Mariette,** FRANÇOIS AUGUSTE FERDINAND, 1821–1881. French Egyptologist and excavator; founder of the Boulak (now Gizeh) Museum. The life-like realism of older Egyptian art was unknown until revealed by his excavations. *Monuments of Upper Egypt*, tr. 1877; *Outlines of Egyptian History*, 1864–74.

**Marignano.** See MELEGNANO.

**Marigold.** *Calendula officinalis.* Annual yellow-flowered plant of the Composite family, native of Europe; much planted for ornament.

**Marigold,** FETID. *Dysodia chrysanthemoides.* Strong-smelling plant of the Composite family, native of the s. U. S. and Mexico.

**Marigold,** MARSH. *Caltha palustris.* Yellow-flowered



Marsh Marigold (*Caltha palustris*).

vernal marshy plant of the Buttercup family, native of the n. hemisphere, locally erroneously known as Cowslips.

**Marilhat,** PROSPER, 1811–1847. French painter. His works extant are few but of the first rank, and show the best qualities of the school of Theodore Rousseau.

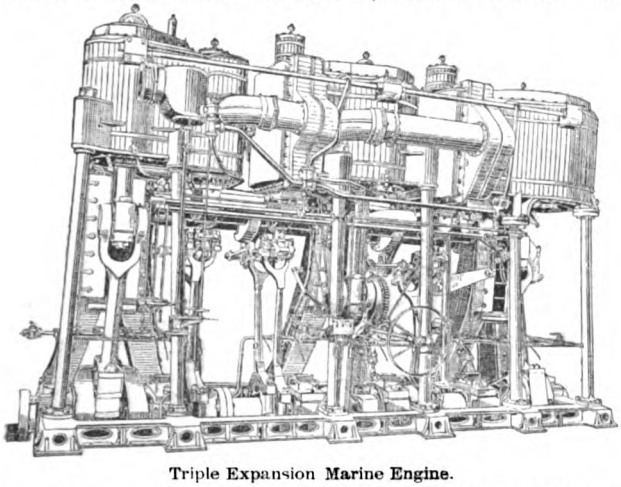
**Marina,** b. ab. 1502. Native mistress and interpreter of Cortez, to whom she was useful during his conquest of Mexico.

**Marine Barometer.** Any form adopted for use at sea, as Hooke's, 1660, which was a glass tube; or the modern Marine mercurial, which has a closed cistern; or the aneroid, which has no mercury or glass, and is least liable to breakage.

**Marine Boiler.** Form of internally fired boiler for steamship use. It has to be self-contained, as no brick-setting is possible. In large vessels, the boilers are on both sides of a central gangway from which the firing is done, the boilers in groups delivering their smoke and gases to a central stack. In the type now approved, the shell is cylindrical, with two fur-

naces in the lower part. The furnaces and the ash-pit are surrounded with water in water-legs, and the gases pass back through large flues. In a back-connection, also surrounded by water, the smoke and gases rise and come forward through tubes to the front connection, whence they pass off to the chimney: hence the water level stands high in such boilers. There is often no dome on each separate boiler, but a large pipe connects the boiler through a valve with a steam chimney (see DOME). The earlier or Martin boiler was not circular, but was shaped with flat areas, so as to conform to the profile of the hull athwart-ship: the flat surfaces were stayed together. Marine boilers are often of plate 1⅛ inch thick, and carry from 120 to 160 lbs. pressure per sq. in. Torpedo boats often use LOCOMOTIVE BOILERS (q.v.): see also BOILERS.

**Marine Engines.** For ship propulsion. They usually drive helical propellers, and are inverted vertical engines, the cylinder above the shaft and cranks. In war vessels, where the engine was to be kept below water line, the mechanism often has been of the back-acting type, and arranged athwartship horizontally. Modern propeller engines are of the compound or triple expansion type, with the cranks at 90° or 120° respectively, operating with a receiver, with single, double, or triple engines, according to the size of the vessel. Stephenson or Joy valve motions operated by steam are used for reversing and to vary the cut-off. Surface condensation is universal. For paddle-wheel steamers, the engines in the e. U. S. are beam-condensing with one cylinder, using poppet valves, with Stevens or drop cut-off and jet condensers. For the shal-



Triple Expansion Marine Engine.

lower western rivers, horizontal engines of long stroke are used, so as to distribute the weight over the hull, which has to be a truss of little depth. In stern-wheelers the two engines are coupled together; in side-wheel vessels the engines are usually separate, by which rapid maneuvering power is secured. Such engines usually work non-condensing. A few vertical back-acting engines without walking beam are still running, but no new ones have been built. In the past, for paddle-wheel propulsion, side-lever engines have been used, and oscillating engines (see both titles), to bring down the center of gravity and keep the engine below range of hostile shot.

**Marine Glue.** See CEMENT.

**Marine Insurance.** See INSURANCE.

**Mariner's Compass.** See COMPASS.

**Marines.** Troops serving at naval stations and on ships of war; first established in England, Oct. 16, 1664, and in N. America, Nov. 10, 1775. The U. S. Marine Corps was organized by Act of July 11, 1798, and since then has been a portion of the naval force, liable to do duty either on vessels of war at sea, in forts, or otherwise as the Pres. may direct. Its headquarters are at Washington.

**Marini,** GIAMBATTISTA, 1569–1625. Italian poet, of large and evil influence. *Adone*, 1622.

**Marinus I.** Pope 882–884.—II. 942–946. They are also called Martin II. and III.

**Mario,** GIUSEPPE, COUNT DI CANDIA, 1810–1883. Piedmontese officer, who adopted the operatic stage 1838, and became the most admired tenor of his time; husband of GRISI (q.v.), with whom he came to New York 1854. He retired 1867.

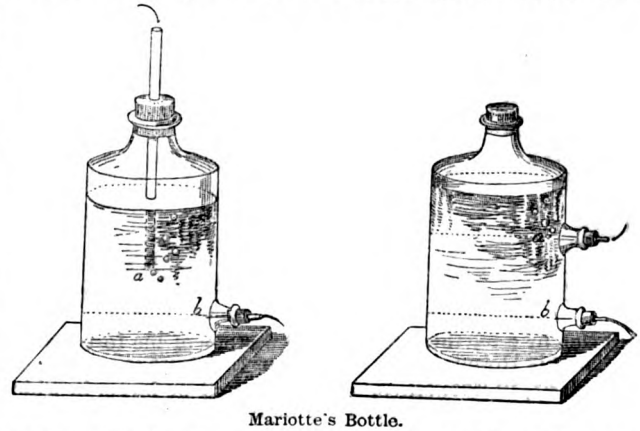
**Mariolatry.** Worship of Mary as "Mother of God" and source of help and grace. Protestants contend that the R. C. Ch. allows her honors which belong to Christ alone. The dogma of her Immaculate Conception was proclaimed by Pius IX. 1854.

**Marion,** FRANCIS, 1732–1795. Partisan officer in S. C. He rendered brilliant services 1781–82 against the British, who called him the "Swamp Fox."

**Marionettes.** Puppets, moved on a stage by cords, wires, or springs; used by the ancients, and long in Europe; revived 1872 in England.

**Mariotte,** EDME, ab. 1620–1684. French physicist. *Nature de l'Air*, 1676.

**Mariotte's Bottle.** Apparatus employed to obtain a uniform flow of liquid. Through a stopper at top passes an open vertical tube with the lower end below the surface of the liquid. Near the bottom is a lateral efflux tube. If this be opened the velocity of efflux presently becomes constant, and is due to the




Mariotte's Bottle.

height of the lower end of the vertical tube above the lateral opening. The air in the closed space above the liquid is at a pressure a little less than an atmosphere. The flow continues approximately constant till the surface of the liquid comes to a level lower than the end of the vertical tube.

**Mariotte's Law.** Properly known as the Boyle-Mariotte Law. See BOYLE, LAW OF.

**Maritime Law.** Body of legal rules governing marine business; especially that relating to shipping.

**Maritime Province.** Strip of territory along the Siberian coast of the Pacific Ocean from Corea to Arctic Ocean, including Kamchatka and several small islands along the coast; length 2,300 m., width 40–230 m., area 715,990 sq. m. Pop., 1894, ab. 130,000.

**Marius,** CAIUS, 157–86 B.C. Leader of the Roman plebeians; tribune 119 B.C., consul 107 and 104–99; victorious over the Teutones and Cimbri 102–101; hailed as 3d founder of Rome. In 88 he obtained, by vote of the commons, the command of the war against Mithridates, which the Senate had conferred on Sulla, but was forced to flee; was captured, and escaped to Carthage. He returned 86, joined Cinna, entered Rome, proclaimed himself and Cinna consuls, and let loose his soldiers to murder and plunder.

**Marivaux,** PIERRE, CARLET DE CHAMBLAIN DE, 1688–1763. French dramatist and novelist. *Marianne*, 3 vols., 1730–41.

**Marjoram.** *Origanum vulgare.* Perennial, purple-flowered herb of the Mint family, native of Europe, naturalized in N. America. The Sweet Marjoram is *O. marjoranum*, also native of Europe, cultivated as a pot-herb.

Common Marjoram (*Origanum vulgare*).

**Mark,** IN ECONOMIC HISTORY. Primitive unit of settlement and social organization of the Teutonic races, after their occupation of definite areas of land. It consisted of the village, the arable mark or stretch of farming land, and the common waste or forest.

**Mark.** 1. German unit of coinage since 1861; value 24 cents. 2. In England, 1194–ab. 1700, gold coin worth 13s. 4d., or ab.$3.30. 3. Standard weight in Germany and elsewhere ab. 1050–1857; equal to 233.8 grammes.

**Mark,** ST. Disciple of Peter, companion at times of Paul and Barnabas; traditional founder of the ch. at Alexandria; author of the second Gospel, probably ab.64. His day is April 25.

**Mark Antonio** (RAIMONDI), 1487–1539. Italian engraver on metal, who reproduced the works of Raphael; one of the first to achieve rank and distinction. *Adam and Eve; Dance of Cupids; Judgment of Paris; Bacchanalian Frieze.*

**Mark Antony.** See ANTONY.

**Markab.** Village of Syria, 50 m. n.e. of Tripoli. The castle, on a mountainous promontory, is connected with Jebel

Ruins of the Fortress of the Knights Hospitalers.

Ansarich by a narrow isthmus, and was one of the fortresses of the Knights Hospitalers in the time of the Crusades.

**Market,** IN ECONOMICS. District, small or large, in which buyers and sellers are sufficiently numerous and active to keep the price of a commodity practically the same at any given time for the whole district.

**Market Overt.** Open, public and legally constituted market. The bona-fide purchaser of a chattel in it acquired perfect title. None exist in U. S.

**Market Price.** That which an article sells for in the open market, as distinguished from its normal price; determined in amount by the final utility of the commodity.

**Markham,** CLEMENTS ROBERT, F.R.S., b. 1830. English traveler, especially in Peru and India; ed. *Geographical Mag.*, 1872–78; prolific writer. *Yuca Grammar and Dict.*, 1863–64; *Missions to Thibet*, 1877; *Hist. Peru*, 1892.

**Marking Ink.** See INK.

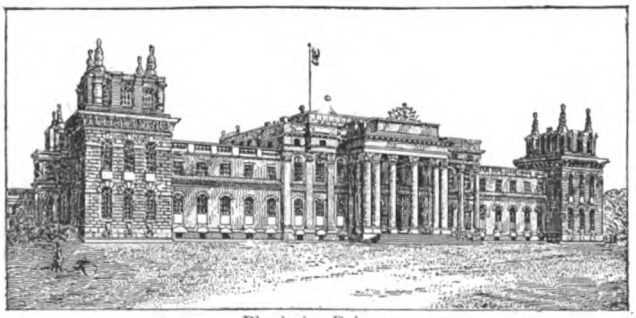
**Marking Nut.** *Semecarpus anacardium.* Tree of the natural family *Anacardiaceæ*, native of India, bearing a hard black fruit, used for marking linen.

**Marks,** HENRY STACY, b. 1829. English painter, R.A. 1878.

**Marl.** Earth consisting mainly of clay with a large percentage of calcium carbonate, and smaller quantities of other mineral substances. The green sand marls of N. J. and the marls of the South have found extensive application as mineral fertilizers, containing calcium phosphate and potash.

**Marlborough.** City of Middlesex co., Mass., 25 m. w. of Boston; noted for boot and shoe manufactures; chartered 1890. Pop., 1890, 13,895.

**Marlborough,** JOHN CHURCHILL, 1650–1722. English general, of pre-eminent military genius but despicable character. He rose as a courtier of the Duke of York (James II.), and became Baron 1682–85, and Earl and Lieut.-gen. 1689, after deserting his master, but was dismissed 1692 on charges of treason



Blenheim Palace.

to William III. Anne's accession brought him to the front; he was made Duke 1702, and gained a series of brilliant victories from Blenheim, 1704, to Malplaquet, 1709, but was again dismissed 1712, on a charge of peculation. George I. took him into high favor 1714.—His wife, SARAH JENNINGS, 1660–1744, was Anne's bosom friend till 1711, and left £3,000,000.

**Marlitt,** E. See JOHN, EUGENIA.

**Marlowe,** CHRISTOPHER, 1564–1593. English dramatist and poet; author of *Tamburlaine*, 1586–90, *Dr. Faustus*, 1588, *The Jew of Malta*, and *Edward II.*, ab. 1590. He was the first to discover the power of blank verse as a vehicle of dramatic expression.

**Marmaduke,** JOHN SAPPINGTON, 1833–1887. Gen. C.S.A. 1862–65; Gov. of Mo. 1884.

**Marmalade.** Semi-liquid preserve, made from thick rind fruit, the pulp and rind being boiled separately and again boiled with sugar.

**Marmier,** XAVIER, 1809–1892. French author and translator.

**Marmion,** SHACKERLEY, 1602–1639. English dramatist.

**Marmol,** JOSÉ, ab. 1818–1871. Argentine poet, dramatist, and novelist.

**Marmont,** AUGUSTE FRÉDÉRIC LOUIS VIESSE DE, 1774–1852. French general, made Duke of Ragusa 1806 and Marshal 1809. After sharing all Napoleon's campaigns, he turned against his master 1814, and was thenceforth a royalist. *Institutions Militaires*, 1845; *Memoires*, 9 vols., 1856–57.

**Marmontel,** JEAN FRANÇOIS, 1723–1799. French dramatist and novelist; Academician 1763. *Moral Tales*, 1761; *Belisaire*, 1767; *The Incas*, 1778; *Elements of Literature*, 1787; *Memoirs.* His works filled 31 vols.

**Marmora,** SEA OF (PROPONTIS). Between the Black and Mediterranean Seas, connected with the former by the Bosphorus, and with the latter by the Dardanelles. It separates European from Asiatic Turkey. Area 4,500 sq. m.

**Marmosets.** Small S. American monkeys, of genera *Hapale* and *Midas.* They are insectivorous. Most have long ringed tails and are brightly colored. *H. chrysoleucos*, 7 in. long, is

Marmosets.

1. *Hapale jacchus*; 2. *H. argentata*; 3. *H. penicillata.*

white and its face is naked. *H. jacchus*, a variable species, is the one most common in menageries. *Midas* has 24 species, some of which have ruffs of long hair on the head. Marmosets are very sensitive to cold. Two or three young are born at a time, after 3 months' gestation. See ARCTOPITHECINI.

**Marmots.** See ARCTOMYS.

**Marne.** Right-hand branch of the Seine, which it joins near Paris, after a n. and w. course of 326 m.

**Marnix,** PHILIPP VAN, LORD OF ST. ALDEGONDE, 1538–1598. Flemish patriot and author, long associated with William the Silent. His political career was closed by his failure to repel the Spaniards in the memorable siege of Antwerp, 1585.

**Marocco.** See MOROCCO.

**Marochetti,** CARLO, BARON, 1805–1868. Italian-French sculptor, in London from 1848.

**Maroni.** River between French and Dutch Guiana. Length ab. 420 m.

**Maronites.** Syrian tribe and sect. Their center of settlement is on Mount Lebanon, where they number ab. 200,000. Originally Monothelites, they have been subject to Rome since 1445, though using their own rites.

**Maroons.** 1. Descendants of fugitive slaves in Jamaica, troublesome 1655–1795. 2. Similar class in Guiana.

**Maros.** European river, rising near the frontier of Moldavia, passes through Hungary and empties into the Theiss. Length 400 m., navigable 228 m., drainage area 16,972 sq. m.

**Marot,** CLÉMENT, ab.1497–1544. Fr. poet, whose version of the Psalms had a powerful effect in advancing the Reformation.

**Marozia,** d. 938. Roman intriguer, mistress, mother, or grandmother of several popes.

**Marprelate,** MARTIN. Pseudonym of the authors of seven Puritan attacks upon Queen Elizabeth's ecclesiastical policy, 1588–89, attributed to John Penry, John Udall, and three others.

**Marque,** LETTERS OF. Authorizing a vessel to act as privateer; issued by government in time of war.

**Marquesas Islands.** In Pacific, lat. 8°–10° 30′ S., long. 138°–141° W.; discovered 1595–1797; acquired by France 1842. Total area, 492 sq. m.; pop., 1889, 5,054, and dwindling.

**Marquetry.** Art of decorating with different veneers of wood.

**Marquette.** Capital of M. co., Mich.; on Lake Superior; center of a region important for its iron mines and lumber. Pop., 1890, 9,093.

**Marquette,** JACQUES, 1637–1675. French Jesuit, missionary in Canada from 1666. With Joliet and 5 others, in 2 canoes, he explored the Mississippi from the Wisconsin to a point below the mouth of the Arkansas 1673, returning by the Illinois.

**Marquez,** JOSÉ ARNALDO, ab. 1825–1881. Peruvian poet.

**Marquez,** LEONARDO, b. ab.1820. Mexican general, officer of Maximilian 1863–67.

**Marquis.** Degree of nobility between duke and earl, extant in England from 1385 and in Scotland from 1599; derived from the lords-marchers of the border.

**Marradi,** GIOVANNI, b. 1852. Italian poet.

**Marriage.** Legal status of husband and wife. How and by whom it may be entered into, and how dissolved, are matters of State law, differing in various jurisdictions. By the English common law, the legal personality of the wife was merged in that of the husband; he became vested with the title to her personal property in possession and with the use of her real estate. See HUSBAND AND WIFE.

**Marrow.** Soft substance contained in the cavities of bone: yellow in long bones, where it is largely composed of adipose tissue, and red in cancellated bones, where it is mostly composed of cells, marrow cells.

**Marryat,** FREDERICK, 1792–1848. English naval officer (1806–20) and novelist. *King's Own*, 1830; *Newton Forster*, 1832; *Peter Simple*, 1833; *Jacob Faithful*, *Japhet*, and *Midshipman Easy*, 1834; *Snarleyyow*, 1836.—His daughter, FLORENCE, Mrs. F. Lean, b. 1837, has pub. his *Life*, 1872, and many novels.

**Mars.** Roman god of battle; identified with Greek Ares, and honored next to Jove; son of Jove and Juno, and father of Romulus. His priests, the Salii, guarded in his temple a shield and spear which were said to have fallen from heaven.

**Mars.** Fourth planet in order of distance from the sun, 141,500,000 m.; diameter 4,230 m.; mass .107 that of the earth; period of revolution about sun 686.95 days; time of revolution about axis 24h. 37m. 22.72s. There are two satellites, Phobos and Deimos, discovered by Hall at Washington 1877. At opposition Mars may approach the earth within 35,500,000 m. The conditions for telescopic examination of the surface are then especially favorable. The planet appears to resemble the earth in many important respects; the inclination of the equator to the plane of the orbit, 24° 50′, is nearly the same as that of the earth, producing a similar succession of seasons. There is an atmosphere of considerable extent. The markings on the surface are of four kinds; (a) bright spots about the poles, believed to be snow and ice; (b) dark greenish patches of irregular outline, supposed to be water; (c) bright portions, probably land; (d) long thin lines, running sometimes for great distances in directions nearly straight, first seen by Schiaparelli 1877. The latter are called canals, although the explanation of their true nature has puzzled astronomers not a little. They are generally assumed to be water-courses. They seem to be unlike anything on the earth, especially if it be true, as stated by a number of observers, that many of them are double. There is not the slightest reason for supposing them to be artificial.

*Satellites of Mars.*

| Name. | Distance in miles. | Sidereal period. | Diameter in miles. |
|---|---|---|---|
| Phobos | 5,850 | 7h. 39m. 15.1s. | 7.2 |
| Deimos | 14,650 | 1d 6h. 17m. 54.0s. | 5.2 |

**Mars,** ANNE FRANÇOISE BOUTET-MOUVEL, 1779–1847. French actress, the greatest of her time; connected with the Théâtre Français 1799–1841.

**Marsala.** Seaport of e. Sicily, on site of ancient Lilybæum. Here Garibaldi began his march of liberation May 1860. Pop. 34,202.

**Marsala Wine.** Sicilian wine resembling sherry; it contains 4.3 grs. acid per oz., 10 grs. sugar and 20 per cent alcohol.

**Marschner,** HEINRICH, 1796–1861. German opera composer, leader with Weber and Spohr in the Romantic movement; hofkapellmeister in Hanover 1831–59. His most successful operas, which influenced Wagner, are *Der Vampyr* (1828), *Templer und Jüdin* (1829), and *Hans Heiling* (1833), his masterpiece.

**Marsden,** SAMUEL, 1764–1838. Chaplain to the convict settlement in Australia 1794; founder of the Maori mission, New Zealand, 1810.

**Marsden,** WILLIAM, D.C.L., 1754–1836. Irish author and numismatist, in India 1771–79. *Hist. Sumatra*, 1782; *Malay Grammar and Dict.*, 1812.

**Marseillaise.** French political hymn, composed, words and music, by Rouget de Lisle, April 24, 1792; originally called *Chant de guerre pour l'Armée du Rhin;* arranged for instruments, and sung by the Garde Nationale as they entered Paris on July 10, and while they marched against the Tuileries Aug. 10. Louis Philippe pensioned the author.

**Marseilles.** Seaport of s. France; founded ab. 600 B.C. by Greek colony from Asia Minor; introducer of Greek civilization into Gaul; taken by Julius Cæsar; united, with the rest of

The Port of Marseilles.

Provence, to France 1481. It is of great commercial importance, and is defended by a citadel and other works; its harbor will accommodate 1,200 vessels. Pop., 1891, 403,749.

**Marsh,** GEORGE PERKINS, LL.D., 1801–1882. American philologist, M.C. from Vt. 1843–49; U. S. Minister to Turkey 1849–53, and to Italy from 1861; author of *Lectures on the English Language*, 1861, its *Origin and History*, 1862, and *Man and Nature*, 1864–74.

**Marsh,** HERBERT, D.D., 1757–1839; prof. Cambridge 1807, Bp. of Llandaff 1816 and Peterborough 1819; prominent in biblical criticism and polemics.

**Marsh,** OTHNIEL CHARLES, LL.D., b. 1831. Prof. of Paleontology at Yale 1866. He made numerous visits to the Rocky Mountains and brought back immense quantities of vertebrate fossils of Cretaceous, Eocene, and Miocene age. His descriptions, pub. by U. S. Survey, form important contributions to the Vertebrate Paleontology of N. America. His restorations have supplied some of the clearest illustrations of the genealogy of the *Mammalia*.

**Marshal.** Officer of the U. S. courts, charged with the execution of process and other administrative duties. The marshal and the deputies appointed by himself have in each State the same power as the sheriff and his deputies in such State may have.

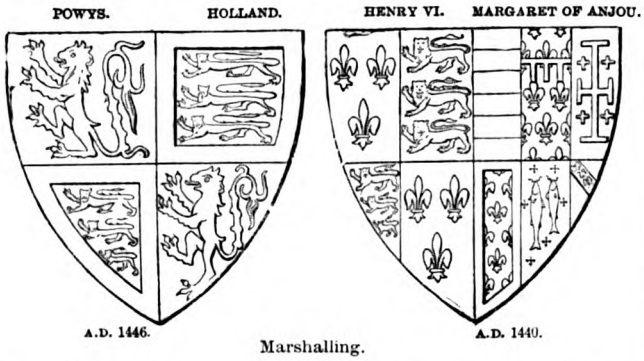
**Marshall,** ALFRED, b. 1842. Prof. of Political Economy at Cambridge 1884. *Economics of Industry*, 1879; *Principles of Economics*, 1890.

**Marshall,** HUMPHREY, 1812–1872. M.C. from Ky. 1849–52 and 1855–59; U. S. Minister to China 1852–54; Brig.-gen. C.S.A. 1861–62.—His grandfather, HUMPHREY, cousin of the chief-justice, pioneer in Ky. and U. S. Senator 1795–1801, wounded Clay in a duel 1809, and pub. a highly personal *Hist. Ky.*, 1812–24.

**Marshall,** JAMES WILSON, 1812–1885. Discoverer of gold near Sutter's Fort, Cal., Jan. 18, 1848.

**Marshall,** JOHN, LL.D., 1755–1835. Officer in American Revolution 1775–79; prominent in Va. affairs; Envoy to France, 1797, with Pinckney and Gerry; M.C. 1799; Sec. of State 1800–1; U. S. Chief-justice from 1801. He was a leading Federalist and a great constitutional lawyer, whose decisions were profoundly respected and have exerted lasting influence. *Life of Washington*, 5 vols., 1804–7.

**Marshalling.** Combining of different coats-of-arms in one escutcheon for the purpose of indicating family alliance or



Marshalling.

office. In early heraldry, only one coat was exhibited in a shield, but the arms of husband and wife were placed side by side.

**Marshalsea Prison.** In Southwark, London; erected ab. 1200; in later years used to confine debtors; celebrated by Dickens in *Little Dorrit*.

**Marsh Elder.** See HIGHWATER SHRUB.

**Marsh Gas.** $CH_4$. Methane; sp. gr. 0.56; simplest combination known of carbon and hydrogen; gas, which burns easily to carbonic acid and water; produced by decaying vegetable matter, and therefore rising from swamps and marshes; main constituent of natural gas and of the gases in oil wells; easily prepared by heating dry acetate of soda with caustic soda; present in large amounts in illuminating gas; not easily attacked by chemical agents, but acted upon by chlorine forming methyl chloride; slightly soluble in water. It forms with air an explosive mixture, called fire damp by miners.

**Mars' Hill.** See AREOPAGUS.

**Marshman,** JOSHUA, D.D., 1768–1837. English Baptist, missionary in India from 1799; colaborer with Carey on a Sanskrit grammar. He wrote much on the Chinese language, and tr. Confucius.

**Marsh's Arsenic Test.** See ARSENIC.

**Marsian** (or MARSIC) **War.** Social war in Italy, 90–88 B.C.; so called because the Marsi were prime movers of it.

**Marsileaceæ.** Family of *Rhizocarpeæ*, an order of heterosporous *Pteridophyta*, including a few aquatic species, natives of tropical and temperate regions.

**Marsipobranchii.** See CYCLOSTOMI.

**Mars-la-Tour** (or VIONVILLE), BATTLE OF. In n.e. France; gained by 2d German army after 12 hours' fighting, Aug. 16, 1870, but with loss of ab. 17,000 killed and wounded on each side.

**Marston,** JAMES WESTLAND, LL.D., 1820–1890. English dramatist and critic, father of the blind poet PHILIP BOURKE, 1850–1887.

**Marston,** JOHN, ab. 1575–1634. English poet and playwright, author, with Chapman and Jonson, of *Eastward Ho*, 1605, for which they were imprisoned. His eight plays were collected 1856 and 1885.

**Marston Moor.** Plain 7 m. w. of York, where the Parliamentary and Scotch forces gained a decisive victory over the Royalists led by Prince Rupert, July 2, 1644.

**Marstrand,** WILHELM NICOLAS, 1810–1873. Danish painter.

**Marsupial Bones.** See MARSUPIAL POUCH.

**Marsupialia.** See METATHERIA.

**Marsupialida.** See CHARYBDEIDÆ.

**Marsupial Pouch,** or MARSUPIUM. Pouch formed by an external fold of skin on the abdomen of Metatherian Mammals, in front of the pelvis, supported by two special (epipubic) bones and inclosing the teats. The young are born in a very immature condition, placed in this pouch, and attached to the teats to complete their development.

**Marsus,** DOMITIUS, 1st cent. Latin poet, known by fragments.

**Marsyas.** Satyr of Phrygia, who challenged Apollo to a musical contest, the victor to do what he pleased with the vanquished. The Muses decided against him, and the god flayed him and hung up his skin in the cave from which flows the river Marsyas.

**Martaban,** GULF OF. Inlet in Malay peninsula from Bay of Bengal.

**Martel.** See CHARLES MARTEL.

**Martelli,** PIETRO JACOPO, 1665–1727. Italian tragic poet.

**Martello Towers.** Round, ab. 40 ft. high; built for coast defense, especially in Kent and Sussex, opposite the French

Martello Towers, Pevensey Bay, Eng.

coast; named from Italian towers, designed to watch Mediterranean pirates and give warning by striking a bell with a hammer.

**Martens.** Weasel-like animals, of genus *Mustelus*, but larger and stouter than the weasel. *M. pennanti*, the Pekan, Fisher, Blackcat, etc., is 2 to 3 ft. long, the tail 1 ft., and lives in the forests of n. temperate America. It feeds on mice, but also attacks the porcupine and raccoon. It never catches fish, but is notorious as a stealer of bait and animals from hunters' traps. Its color is grayish brown above and darker below. For Pine Marten, see SABLE.

**Martensen,** HANS LASSEN, D.D., 1808–1884. Prof. Copenhagen 1840; Bp. of Seeland and Primate of Denmark 1854; eminent for ability and learning. *Meister Eckhart*, 1840; *Dogmatics*, 1849, tr. 1866; *Ethics*, 1872–78, tr. 1873–83; *Autobiography*, 1883.

**Martha.** One of two sisters of Bethany, near Jerusalem, devoted friends of the Saviour, who raised their brother Lazarus to life.

**Martha's Vineyard.** Island off s. coast of Mass., ab. 20 m. by 5. Large religious camp-meetings are held here in summer.

**Martialis,** MARCUS VALERIUS, ab. 40–ab. 104. Latin poet of Spain, of whose epigrams we have 1,500 arranged in 15 books; noted for wit and low moral tone. No complete English version exists.

**Martial Law.** Military rule exercised by a State over its own citizens in an emergency justifying it; during a state of war, at a time of insurrection, rebellion, riot or other emergency, when there is present or imminent a public danger which ordinary means are incompetent to avert. It is inaugurated in U. S. by proclamation of the Pres. as Commander-in-chief, or by a declaration of the commanding general. This notification designates the place or district within which military authority displaces the civil courts.

**Martin I.** Pope 649, expelled and banished 653–54 by Constans II.; d. in the Crimea 655.—II. 882–884.—III. 942–946; see MARINUS.—IV. Simon de la Brie, pope 1281–85.—V. Otto Colonna, 1363–1431; elected pope 1417 by the Council of Constance on the deposition of John XXIII.; promoter of crusades against the Hussites.

**Martin,** ST., 316–ab. 400. Bp. of Tours 371, supposed miracle-worker, active in conversion of pagans; patron saint of France.

**Martin,** BON LOUIS HENRI, 1810–1883. French historian, Senator 1876, Academician 1878. His *Hist. France*, 15 vols., 1833–36, afterward revised and enlarged, is an important work.

**Martin,** EDWARD ARNOLD, 1809–1875. German gynæcologist and obstetrician. Prof. Jena 1837–58. Author of many monographs.

**Martin,** HOMER DODGE, b. 1836. N.A. 1875. American landscape painter, one of the first to practice broad methods; sincere and poetic artist.

**Martin,** JOHN, 1789–1854. English painter of O. T. and legendary subjects, noted for immense attempts and broad, sometimes glaring, effects; illustrator of *Paradise Lost* 1826–27. Several of his works were engraved.

**Martin,** ROBERT MONTGOMERY, ab. 1803–1868. English writer on India, China, and the colonies.

**Martin,** SIR THEODORE, LL.D., b. 1816. Scottish poet, biographer of Prince Albert, 5 vols., 1874–80; translator of Horace, Dante, Goethe, and Heine; author, with W. E. Aytoun, of Bon Gaultier's *Ballads*, 1852.

**Martin,** WILLIAM ALEXANDER PARSONS, D.D., LL.D., b. 1827. American missionary to China 1850; pres. Tungwen Coll., Peking, 1869; Mandarin 1885. *The Chinese*, 1880.

**Martineau,** HARRIET, 1802–1876. English author. Her *Political Economy*, 1832, was popular and useful. *Society in America*, 1837; *Deerbrook*, 1839; *Eastern Life*, 1847; tr. Comte's *Positive Philosophy*, 1853.—Her brother, JAMES, D.D., LL.D., b. 1805, Prof. Manchester 1841, London 1857–85, is the leading Unitarian in England, and one of its chief philosophic thinkers.

*Rationale of Religious Inquiry*, 1836; *Materialism*, 1874–76; *Spinoza*, 1882; *Types of Ethical Theory*, 1885; *Essays*, etc., 4 vols., 1890–91.

**Martinet.** Officer whose administration of discipline and exactions in the line of duty are more likely to produce irritation and disobedience than a willing performance; named from a French general under Louis XIV.

**Martinez Campos.** See CAMPOS.

**Martinez de la Rosa,** FRANCISCO, 1789–1862. Spanish dramatist, poet, novelist, and historian, long in exile, twice foreign minister; pres. of the Senate 1860.

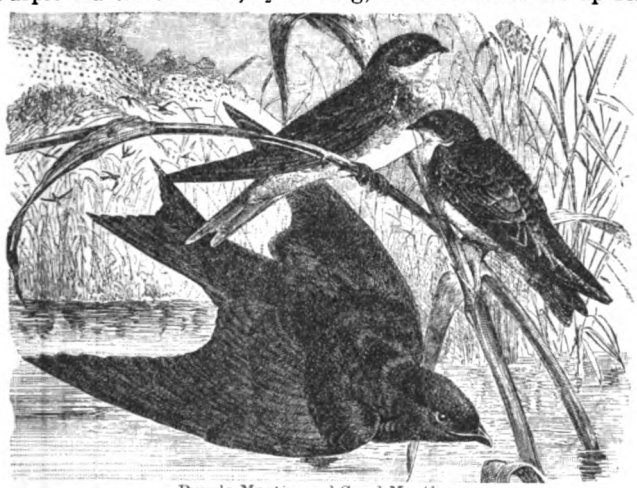
**Martini,** GIAMBATTISTA, 1706–1784. Italian music historian and contrapuntist. *Storia della Musica*, 1757–1781; *Contrappunto*, 1774–1775.

**Martini-Henry Rifle.** Small arm combining the breech-loading device of Martini and the rifled barrel of Henry. Its peculiar feature was the breech-block, which rotated around an axis at right angles to the axis of the bore, above that axis and in rear of the block. The disadvantages were the difficulty of extracting the empty case after firing, the liability of guillotining the cartridge, and the incomplete closing of the chamber.

**Martinique.** One of Lesser Antilles, W. I.; discovered 1493; held by France from 1635, with three intervals of British occupation. Area 381 sq. m.; pop. ab. 178,000, mostly native or negro.

**Martinmas.** One of the four term days for paying rents in Scotland, Nov. 11.

**Martins.** Birds of the Swallow family, but with tails less forked than true swallows. *Progne subis* (*purpurea*), the Purple Martin of U. S., 7½ in. long, nests in boxes set up for



Purple Martin and Sand Martins.

the purpose. The European House Martin builds swallow-like nests on the sides of walls. The Sand Martin (*Clivicola*) burrows 4 to 9 ft. deep into banks of streams.

**Martite.** $Fe_2O_3$. Pseudomorphous mineral, with the chemical composition of hematite and the crystalline form of magnetite or pyrite.

**Martius,** KARL FREIDRICH PHILIPP VON, 1794–1868. German botanist, in Brazil 1817–20; Prof. Munich 1826–64. *Flora cryptogamica Erlangensis*, 1817; *Historia naturalis Palmarum*, 1831–50; *Herbarium Floræ Brasiliensis*, 1837; *Flora Brasiliensis*, 1840–70; *Botanica pharmaceutico-medica*, 1852.

**Martius' Yellow.** See DINITRONAPHTHOL.

**Martyn,** HENRY, 1781–1812. English missionary to India 1805 and Persia 1811; eminent for zeal and holiness.

**Martyn,** THOMAS, 1735–1825. Prof. of Botany at Cambridge 1762. *Plantæ Cantabrigienses*, 1763; *Flora rustica*, 1792–94; *Language of Botany*, 1793.

**Martyr.** One who has borne supreme witness to the name of Christ by dying rather than deny it. Those who thus died under pagan persecution have always been held in highest honor; their numbers are very variously estimated; that of the victims of Christian persecution, chiefly 1200–1600, is probably much greater.—In modern usage, the name indicates those who die for any form of truth or duty.

**Martyrologies.** Lists of martyrs, extant from ab. 700, those of earlier date having perished.

**Marut.** Hindu god of wind.

**Marutsa.** Most important of the African tribes in the Lake Nyassa region. These are each dependent on their chief as absolute monarch, and rise and fall with him. The M. are developing on the ruins of the Makololo kingdom. They are intelligent, energetic, and artistic, but cruel, immoral, superstitious, though friendly and fairly honest. They believe in a Supreme Being who dwells in the blue sky, but do not pronounce his name. The king or queen is absolute owner of all persons, lands, and property. Agriculture, in which both sexes unite, is the main occupation, but numerous artistic and domestic utensils and tools are manufactured with skill.

**Marvel of Peru.** See FOUR O'CLOCK.

**Marvell,** ANDREW, 1621–1678. English lyric poet, satirist, and pamphleteer; M.P. from 1659, associate of Milton and friend of liberty.

**Marx,** KARL, 1818–1883. Most famous and influential of modern socialists; of Jewish descent; active successively in Cologne, Paris, Brussels, and from 1880 in London. He controlled the *International* 1866–72, and wrote *Das Kapital*, 1867, tr. 1887.

**Mary.** Name of pious women of N. T.; viz., the mothers of Jesus, James the Less, and Mark; the sister of Lazarus and Martha; MAGDALEN (q.v.).

**Mary I.,** 1516–1558. Queen of England 1553; daughter of Henry VIII. and Catherine of Aragon; married to Philip II. of Spain 1554; fierce persecutor of Protestants. Cranmer, Latimer, Ridley, and some 300 others were burned during her brief reign; contributing powerfully to the advancement of the cause for which they suffered.

**Mary II.,** 1662–1694. Queen of England 1689; daughter of James II. Her marriage, 1677, to William of Orange brought him to the throne, which she shared.

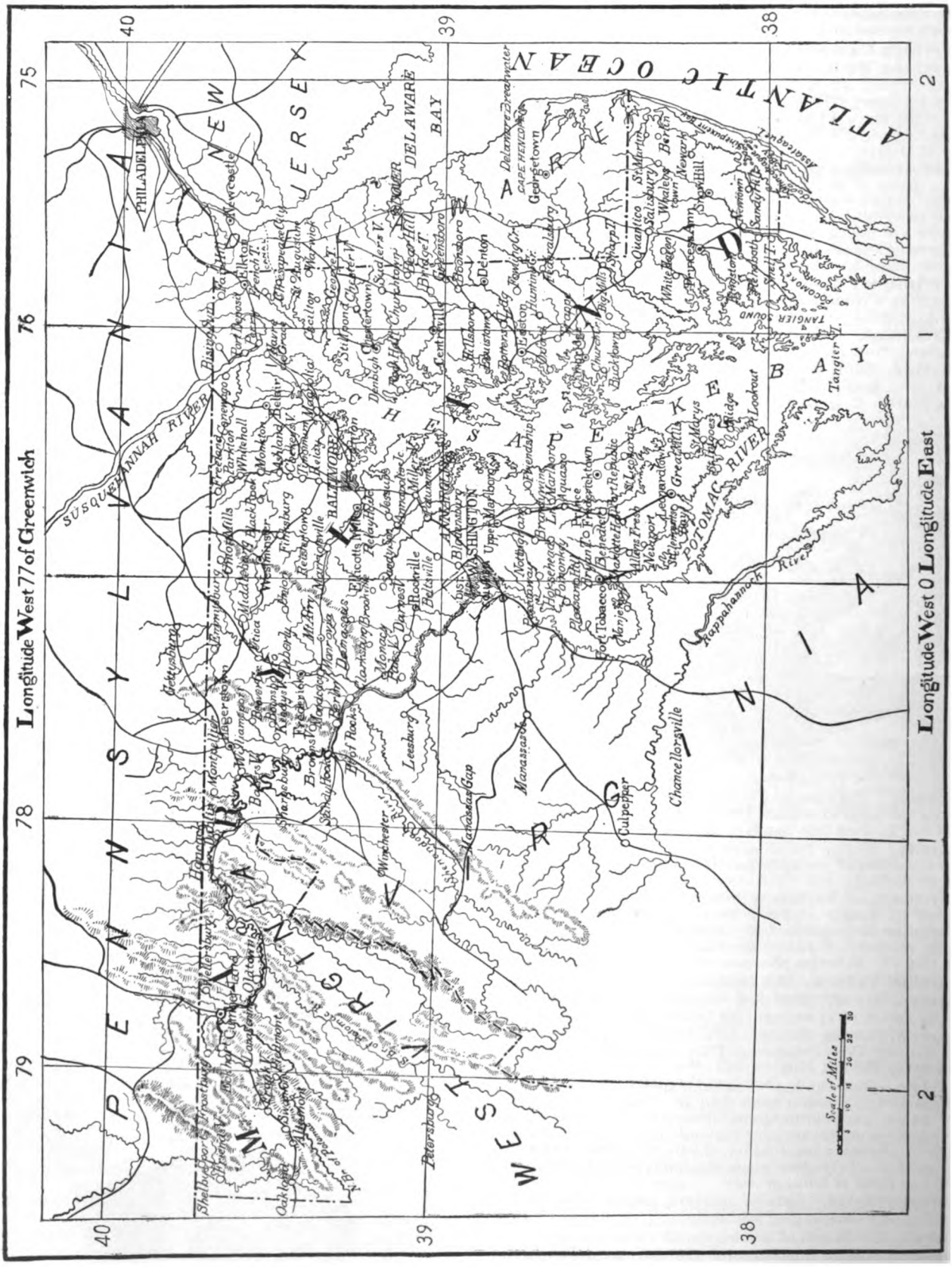
**Maryland.** One of the 13 original States. Its e. part is level, while the w. projection, from the Blue Ridge to the W. Va. boundary, is broken and mountainous. The area is 12,210 sq. m. M. has excellent facilities for navigation in Chesapeake Bay, which extends across the State from s. to n. Into it open numerous estuaries, the mouths of rivers, as the Potomac and Patuxent. The geological structure of the State is complicated. The w. part, within the Alleghany plateau region, is mainly carboniferous; thence follow e. across the Appalachians a succession of outcrops of Silurian, Devonian, and Carboniferous strata. Archæan rocks are found e. of the mountains, including the Blue Ridge and extending e. to Chesapeake Bay, followed by Cretaceous, Neocene, and finally, upon the e. shore, Quarternary beds. The industries are mainly agricultural. In the w. part considerable coal is mined, and along Chesapeake Bay and the Atlantic coast there is an extensive fishing industry. The principle oyster fisheries of the country are in Chesapeake Bay. In 1889, the value of farms was $175,058,550, agricultural products $26,443,364. M. was the first proprietary government established in America. Its charter was obtained from Charles I. by Sir George Calvert, and was given to his son, the second Lord Baltimore. A settlement had already been established on Kent Island in Chesapeake Bay by Wm. Clayborne, and the early years of the colony were disturbed by conflicts with these earlier settlers and by the turbulence of some Puritan settlers. The Baltimores desired to establish the R. C. as the State religion; this was vigorously opposed, and at length the Ch. of England was established by William and Mary, and disabilities imposed upon Catholics and dissenters. M. took an efficient part in the Revolution, was first to ratify the constitution 1788, and in 1790 ceded to the U. S. 64 sq. m. of territory for the national capital. Capital, Annapolis. Pop., 1890, 1,042,390, or 85.4 per sq. m.; colored, 218,004.

**Mary of Burgundy,** 1457–1482. Daughter of Charles the Bold, who became the wife of Maximilian I. See FLANDERS.

**Mary Stuart,** 1542–1587. Daughter of James V. and Mary

Mary Stuart.

of Guise; great-granddaughter of Henry VII. through his daughter Margaret Tudor; Queen of Scotland 1543; affianced


Longitude West 77 of Greenwich
Longitude West 0 Longitude East
PENNSYLVANIA
NEW JERSEY
ATLANTIC OCEAN
DELAWARE BAY
CHESAPEAKE BAY
WEST VIRGINIA
PHILADELPHIA
SUSQUEHANNAH RIVER
POTOMAC RIVER
Rappahannock River
BALTIMORE
WASHINGTON
Cambridge
Easton
Salisbury
Princess Ann
Crisfield
Tangier I.
Scale of Miles

1548 to Francis the Dauphin, and educated at the French court; married 1558; Queen of France 1559–60. She returned to Scotland 1561; was opposed by the reformers; married Henry Darnley 1565; became mother of James VI. 1566. Her marriage with Bothwell, the putative murderer of Darnley, 3 months after Darnley's death, caused a general uprising; she was made prisoner and compelled to abdicate, fled to England, was imprisoned 1568, condemned to death for complicity in the conspiracies against the life of Elizabeth, and executed Feb. 8, 1587. Her charms and misfortunes have won warm sympathy in every age; her character is still a matter of controversy.

**Marzials,** THÉOPHILE, b. 1850. Poet of French parentage, residing in Eng. *Gallery of Pigeons and Other Poems*, 1873.

**Masaccio.** See MASSACCIO.

**Masai.** Warlike native race of e. Equatorial Africa, ethnologically different from the Bantu and negro races. They are taller and of lighter color than the Bantus, are nomadic herdsmen, hunters and robbers, and are greatly feared by their neighbors. They are clever public speakers.

**Masalskii,** CONSTANTIN PETROVICH, 1802–1861. Russian novelist and poet.

**Masaniello** (TOMMASO ANIELLO), 1623–1647. Leader of a revolt against the Spanish viceroy of Naples 1647.

**Mascagni,** PIETRO, b. 1863. Italian composer, leader of the young Italian school. His masterpiece is *Cavalleria Rusticana*, 1890. Other operas are *L'Amico Fritz*, 1891; *I Rantzau*, 1892; *Guglielmo Ratcliff* (revised), 1895; *Silvano*, 1895.

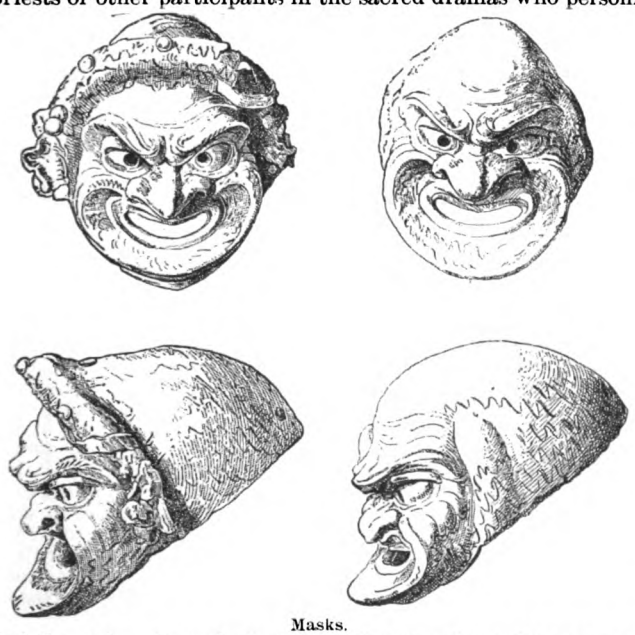
**Mascalonge,** or MUSKALLUNGE. See HAPLOMI.

**Mascart,** ÉLEUTHÈRE ÉLIE NICOLAS, b. 1837. Prof. Coll. de France; writer on static electricity, 1876, and optics, 1880–93.

**Mashonaland.** Province of s.e. Africa, n.e. of Matabeleland, now in process of English colonization. Its mysterious ruins, first made known by Mauch 1871, have been recently explored by T. J. Bent. They appear to be remains of a non-African gold-mining population from Arabia, and antedate the Christian era by many centuries. The most important site of these ruins is Zimbabwe.

**Masinissa,** ab. 238–149 B.C. Numidian king, who aided Carthaginians till ab. 210 B.C., when he joined the Romans. He aided Scipio in reduction of Cirta and in the battle of Zama, 202 B.C., and was given the domains of Syphax 201.

**Mask.** The use of masks in the drama had its origin in primitive culture, when they formed part of the disguise of the priests or other participants in the sacred dramas who personi-



Masks.

fied the gods. As such they were almost universal among savage and barbarous people, and survive especially among the native tribes of America.

**Masked Battery.** One behind a glacis or other covering, completely hidden from the enemy's view, and whose existence is made known only at the time of opening fire. Gen. Gillmore's battery of 47 guns at the n. end of Folly Island was constructed without awakening the suspicion of the Confederates on Morris Island, S. C., and covered the assault of his forces in its capture, July 10, 1863.

**Maskelyne,** NEVIL, D.D., F.R.S., 1732–1811. Astronomer Royal of England from 1765; founder of the *Nautical Almanac*, and its editor from 1767.

**Masolino,** TOMMASO DI CRISTOFANO FINO, 1383–ab.1440. Italian painter, who immediately preceded and influenced MASSACCIO (q.v.). He has frescoes at Castiglione d'Olona near Varese, and in the Brancacci Chapel at Florence. The extent of his work here has been questioned, but the greatest Italian critic, Giovanni Morelli, is authority for its authenticity.

**Mason,** CHARLES, F.R.S., ab. 1730–1787. English astronomer, in America 1763–68, and later. *Lunar Tables*, 1787. See MASON AND DIXON'S LINE.

**Mason,** FRANCIS, D.D., 1799–1874. English-American missionary to Burmah from 1830. *Burmah*, 1852–60.

**Mason,** GEORGE, 1726–1792. Prominent Va. member of the Federal Convention of 1787. He took an active part in all the debates, and his influence was felt in all the decisions of the convention; yet he was dissatisfied with the constitution, and opposed its ratification.—His grandson, JAMES MURRAY, 1798–1871, was M.C. from Va. 1837–39; U. S. Senator 1847–61; framer of the Fugitive Slave Law, 1850; Confederate commissioner to England and France, with John Slidell, 1861. They were taken from a British vessel by Capt. Wilkes, but soon released on the demand of England.

**Mason,** GEORGE HEMMING, 1818–1872. English painter.

**Mason,** JOHN, d. 1635. Gov. of Newfoundland 1616; receiver of several grants 1622–29 in Me. and N. H.

**Mason,** JOHN, 1600–1672. Officer of Conn. forces, who destroyed the Pequots 1637.—His descendant, JEREMIAH, LL.D., 1768–1848, was U. S. Senator from N. H. 1813–17, and the greatest New England lawyer of his day after his friend Webster.

**Mason,** JOHN, d. 1694. Most gifted and important of English hymnists before Dr. Watts. *Songs of Praise*, 1683.—His grandson and namesake, 1706–1763, wrote a once famous book on *Self-Knowledge*.

**Mason,** JOHN MITCHELL, D.D., 1770–1829. Provost Columbia Coll., N. Y., 1811–16; Pres. Dickinson Coll. 1821–24; eminent pulpit orator.

**Mason,** LOWELL, Mus. Doc., 1792–1872. American musician, composer and arranger of hymn tunes; pres. Handel and Haydn Society of Boston 1827–31; founder Boston Academy of Music 1832; promoter of conventions of music teachers, and a voluminous publisher.—His son, WILLIAM, b. 1829, is a pianist, teacher, and composer.

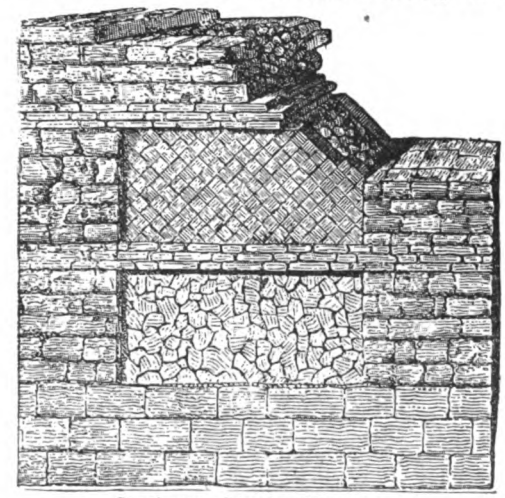
**Mason,** OTIS TUFTON, b. 1838. American othrologist.

**Mason,** WILLIAM, 1725–1797. English poet, biographer of Gray, 1775.

**Mason and Dixon's Line.** Parallel of latitude of which a short distance was run by Chas. Mason and James Dixon 1765, now the s. boundary of Pa. In U. S. history it is often spoken of as the boundary line between the free and the slave States.

**Masonry.** See FREEMASONRY and KNIGHTS TEMPLARS.

**Masonry.** Stones regularly laid, with or without mortar; in the latter case it is called dry masonry. Rubble masonry is formed of undressed stone, cut stone masonry of roughly



Specimens of Ancient Masonry.

dressed blocks, and ASHLAR MASONRY (q.v.) of closely dressed blocks. The cost ranges from $5 to $25 per cubic yard. The strength of masonry is about one-fourth of that of small specimens of stone.

**Masons' Marks.** Several explanations are given of the employment of marks by workmen in masonry, the custom of which goes back to a very early period. One that it was to enable each artisan to properly fit his blocks, and another, that

the master might identify each man's work; while from the supposed symbolism of ancient marks, a somewhat fanciful theory has been erected that they were the emblems of a widespread secret craft, with which it has been attempted to show that modern freemasonry is closely allied. In England, down to the 14th or 15th century, it was customary to put these marks on the outside of the stone, where they remained visible when the building was completed, but they were subsequently placed on the bed of the stone.

**Maspero,** GASTON CAMILLE CHARLES, b. 1846. French Egyptologist, who succeeded Mariette as head of the Boulak (now Gizeh) Museum 1881, but returned to France 1886, and is now prof. at the Institute of Paris. *Historiæ Ancienne de Peuples de l'Orient*, 1885. In his *Egyptian Archæology*, tr. 1887, and in his recent *Dawn of Civilization*, he combines great learning with popular intelligibility.

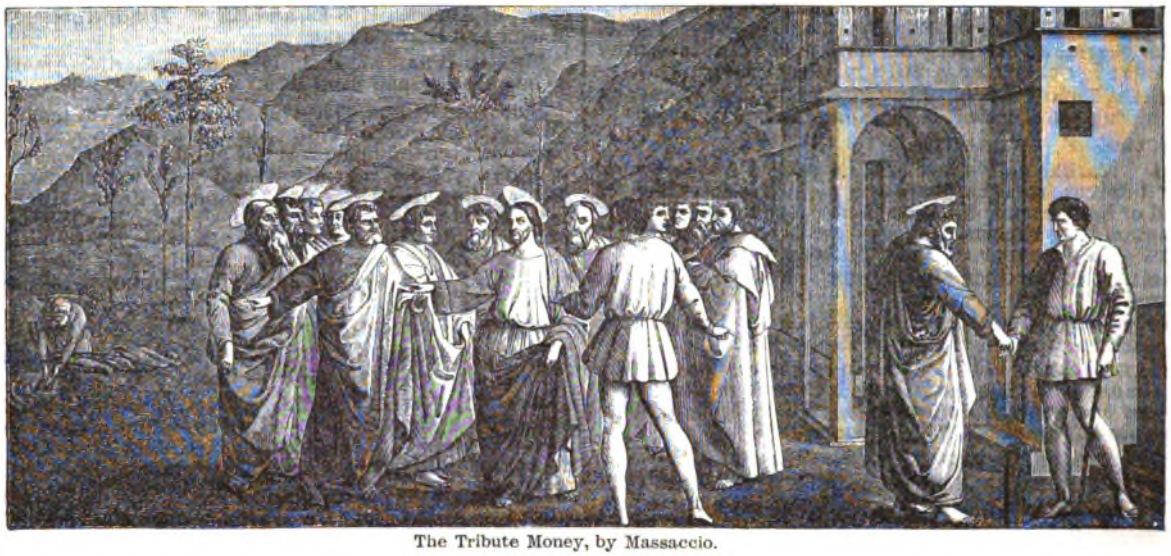
**Masquerade.** Assembly of persons who disguise themselves by wearing masks or fantastic dress. Usually a dancing party. They were in fashion in the court of Edward III. 1340.

**Masques.** Precursors of the opera, introduced into England in the latter part of the 16th century; many were written by Ben Jonson; one at the Middle Temple on the marriage of Elizabeth, Jan. 1613. Milton's *Comus* was given at Ludlow Castle 1634.

**Mass.** Quantity of matter in any body, denoted by the initial M. Since the weight of a body results from the action of gravity tending to produce an acceleration g upon each unit of mass, $W=Mg$; or $M=\frac{W}{g}$. This is the form in which it is often used in formulæ. All forces act upon bodies in proportion to their mass in producing motion or rest, and inertia varies as the mass of a body. It is to be carefully distinguished from weight, which is force; viz., the attraction that the earth exerts on matter. The units in which mass is measured are the gram and the pound. The comparison of masses is dependent upon the principle that mass is equal to the ratio of force to acceleration, so that if we apply equal forces to two masses, the latter will be to each other inversely as the accelerations produced. Practically, since weight is proportional to mass, masses may be compared by weighing them at the same place on the earth. The total mass in a body is equal to the product of its volume and density, or $M=V\rho$.

**Mass.** In R. C. theology, the consecration and oblation of the Eucharist, including the communion of the celebrating priest, but not necessarily in the presence of other persons; held to be a true continuance of the propitiatory sacrifice of the Cross. Its order is (*a*) Introit, formerly vocal now instrumental; (*b*) KYRIE and CHRISTE ELEISON (q.v.); (*c*) GLORIA (q.v.); (*d*) collects, and prayers, Epistle and Gospel, (the two latter separated by the Graduale; (*e*) *Credo;* (*f*) Offertory, usually a vocal or instrumental solo; (*g*) *Sanctus;* (*h*) *Benedictus*, frequently united with the *Sanctus;* (*i*) *Pater noster, Amen, sed libera nos* and *Communio;* (*j*) *Agnus Dei;* (*k*) *Dona nobis pacem*, generally united to the *Agnus*; (*l*) *Ite, missa est.* The setting of the mass has always been looked upon as the highest ambition of the church composer. Anciently, and down to the development of counterpoint, each portion of the mass was sung to its proper tune; these melodies were then laid as the foundation for contrapuntal treatment. In the hands of the composers who came after the strict style had given way to the homophonic, the mass became entirely free and the devices of dramatic expression, as well as the entire secular apparatus, were freely employed.

**Massaccio** (TOMMASO GUIDO), 1402–1429. Florentine painter, who founded the realistic style of the 15th century and overthrew the Mediæval style dating from Giotto. He has frescoes in the Brancacci Chapel, Church of Santa Carmine at Florence; especially famed is the *Tribute Money*.



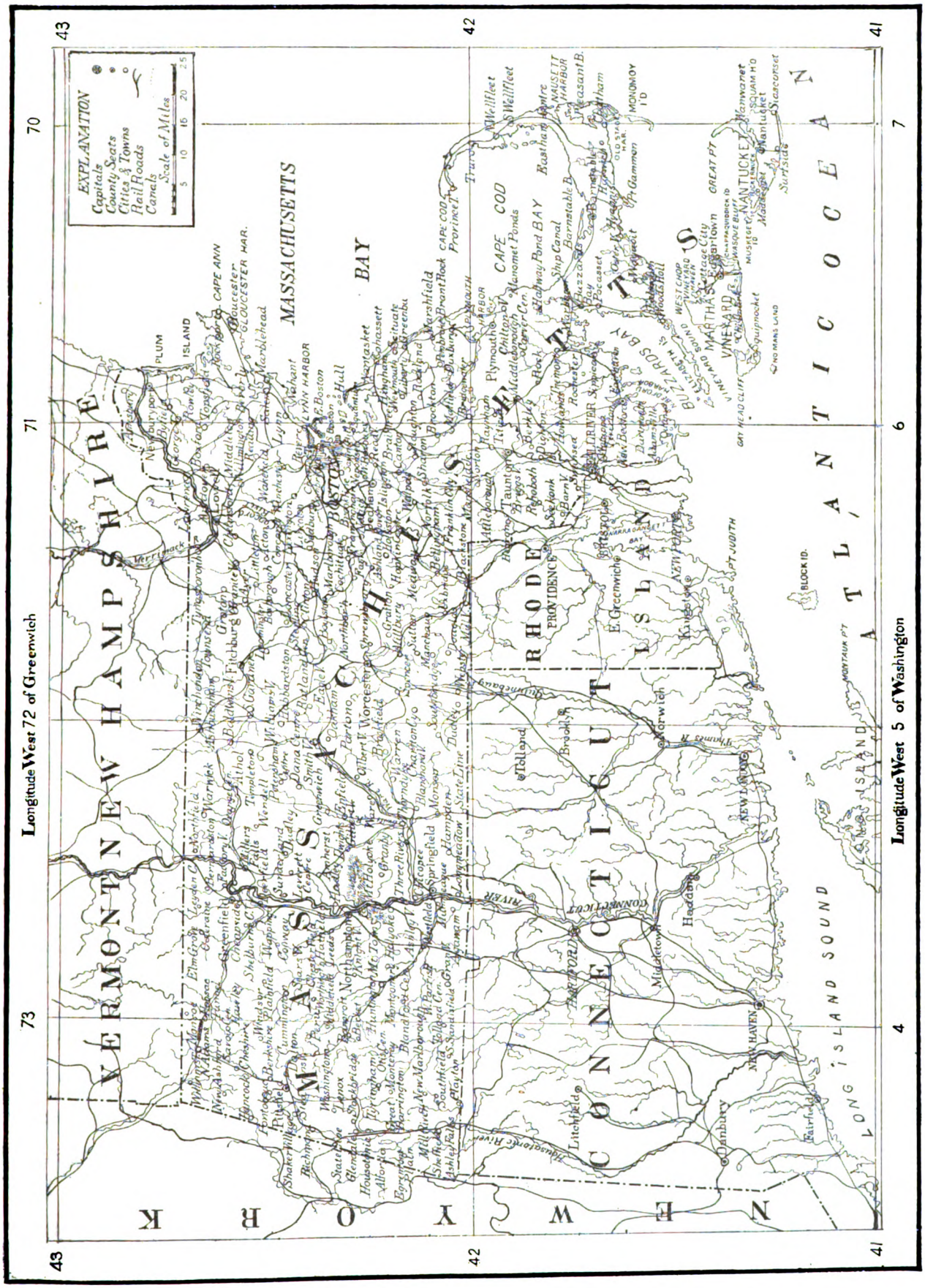
The Tribute Money, by Massaccio.

**Massachusetts.** One of the New England States. Its area is 8,315 sq. m. Its surface is in the e. part undulating, and in many parts covered with rounded hills of glacial origin, rising in the w. part into more decided relief. Along the w. border are the Berkshire hills, which are a s. extension of the Green Mts. of Vt., rising in Mt. Greylock to 3,505 ft. Its rivers are navigable but for short distances from the sea, but it contains numerous smaller streams, the water power of which has been utilized to the fullest extent in its extensive manufactures. Aside from the superficial glacial deposits which cover nearly the entire State, the surface rocks are mainly of the Archæan formation, Silurian outcropping w. of the Connecticut River with Triassic in the Connecticut valley and Silurian immediately w. of it. In the s.e. portion there is a small area of Cretaceous, while Cape Cod and the islands of Martha's Vineyard and Nantucket are Quarternary. The industries of the State are commerce, transportation, manufactures, and fishing. Its farming interests, formerly large, are rapidly diminishing. There is conjectural evidence that the M. coast was touched by Norsemen ab. 1000. It was explored by the Cabots 1497, but no permanent settlement was made until 1620, when the *Mayflower* landed her company at Plymouth. The colony existed as an independent government, no charter being granted by the crown until the Provincial Charter of 1691 united Plymouth colony with M. In 1628, a company headed by John Endicott landed at Salem, with a grant of territory extending 3 m. n. of the Merrimack, 3 m. s. of the Charles, and from the Atlantic to the Pacific. This colony under Winthrop founded Boston 1630 and many of the neighboring towns. It was the center of the persecution of the Quakers and of Roger Williams and others. On account of the early struggles with the Indians, a confederacy was formed of several of the colonies for mutual protection. The struggles with the parent government began almost with the origin of the colony, and increased in bitterness after the granting of the provincial charter in 1691. Active hostilities began in opposition to the Stamp Act, and step by step increased until the revolution was upon the colonies. The first bloodshed was in the Boston massacre 1770; the actual outbreak of war was at Concord and Lexington 1775. Pop., 1890, 2,238,943. (See Map, page 36.)

**Massachusetts Bay.** Indentation on s. coast of Mass.

**Mass Action.** When chemical action takes place between two or more compounds, the quantities of the new compounds formed will be proportionate to, and will often depend upon, the mass of the reacting substances. For example, if a small quantity of water be added to a hydrochloric acid solution of bismuth or antimony chlorides, no perceptible change will occur; if, however, the mass of the water is increased, a precipitate of the oxychloride will be formed, the action depending upon the mass of the water present.

**Massage.** Treatment of the human body by rubbing,


EXPLANATION
Capitals
County Seats
Cities & Towns
Rail Roads
Canals
Scale of Miles
5 10 15 20 25
MASSACHUSETTS BAY
CAPE COD
NANTUCKET SOUND
VINEYARD SOUND
BUZZARDS BAY
NARRAGANSETT BAY
LONG ISLAND SOUND
ATLANTIC OCEAN
VERMONT
NEW HAMPSHIRE
NEW YORK
CONNECTICUT
RHODE ISLAND
Longitude West 72 of Greenwich
Longitude West 5 of Washington
43
42
41
73
72
71
70
7
6
4

stroking or kneading with the hands of a skilled manipulator for relief from pain, increase of the circulation and the removal of morbid products through the latter. It was known to the ancient Greeks. During the last forty years it has been scientifically developed for the relief of local muscular and nerve affections.

**Massalongo,** ABRAMO BARTOLOMMEO, 1824–1860. Prof. in Lyceum of Verona. *Memorie lichenografiche*, 1853; *Schedulæ Criticæ in Lichenes exsiccatos Italiæ*, 1855; *Syllabus plantarum fossilium*, 1859; *Studii sulla Flora fossile*, 1859.

**Massasoit,** d. 1661. Chief of the Wampanoag Indians, who at one time numbered 30,000 and occupied a large part of s.e. New England. He was friendly to the English notwithstanding their usurpation of his lands and liberties.

**Massé,** VICTOR (FÉLIX MARIE), 1822–1884. French composer of 18 operas; the most successful were *Galathée*, 1852; *Les noces de Jeannette*, 1853; *Paul et Virginie*, 1876.

**Masséna,** ANDRÉ, 1758–1817. French general 1793, marshal 1804; Duke of Rivoli 1808, Prince of Essling 1809, having saved the army at the Danube. He had command in Spain 1810–11. His rapacity equaled his talent. *Mémoires*, 7 vols., 1849–50.

**Massenet,** JULES ÉMILE FRÉDÉRIC, b. 1842. French opera composer, Prof. of Composition at the Conservatory. *Le Roi de Lahore*, 1877; *Hérodiade*, 1881; *Le Cid*, 1885; *Manon Lescant*, 1884; *Esclarmonde*, 1889; *Le Mage*, 1891; *Werther*, 1892; *La Navarraise*, 1894.

**Massey,** GERALD, b. 1828. English poet.

**Massicot.** PbO. Yellow lead oxide.

**Massie,** RICHARD, b. 1800. English tr. of German hymns. *Lyra Domestica*, 1860–64.

**Massillon.** City of Stark co., Ohio, on the Tuscarawas. Pop., 1890, 10,092.

**Massillon,** JEAN BAPTISTE, 1663–1742. French Oratorian 1681, pre-eminent as a preacher; Bp. of Clermont 1717, Academician 1719. *Works*, 13 vols., 1745.

**Massinger,** PHILIP, 1583–1639. English dramatist. His best known play is *A New Way to Pay Old Debts*, 1633.

**Massive.** Breaking one way as easily as another, like some sandstones or granite; any rock occurring in large, heavy beds; central mass or plateau of a mountain region.

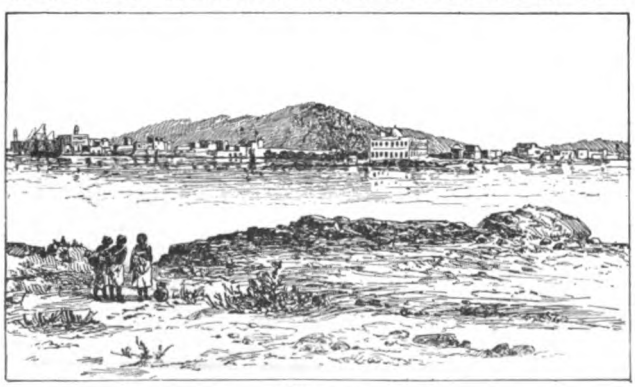
**Mass of Binary Star.** This may be determined when the distance and period of revolution are known. Thus the most recent determinations give for the mass of 61 Cygni $\frac{1}{5}$ that of the sun, for $\alpha$-Centauri 2.14, $\alpha$-Geminarium 0.54, Sirius 5.8. The average of the masses so far determined is about twice that of our sun.

**Masson,** ANTHONY, 1636–1700. French copperplate engraver of portraits. His treatment of flesh is especially fine in the lighter parts, where he made his tones with triangular dots, using the square graver for the purpose, producing what might be called a palpitating color. His work is characterized by great delicacy and firmness. His *Christ at Emmaus* is highly prized by collectors.

**Masson,** DAVID, b. 1822. Scottish critic and biographer; prof. London 1852, Edinburgh 1865; ed. *Macmillan's Mag.*, 1859–68. *Essays*, 1856–76; *British Novelists*, 1859; *Life of Milton*, 6 vols., 1859–80. He edited Milton, 1874, and De Quincey, 1889–91.

**Massorah.** Fragmentary Jewish commentary on O. T., produced, probably at Babylon, between 130 and 1000.

**Massowa.** Town on w. shore of Red Sea, near the border



Massowa.

of Abyssinia; held by Turks 1557–1866; occupied by Italy 1885, and valued for strategic reasons. M. is surrounded by islets, which make navigation difficult. Dysentery and fever are prevalent. Pop. ab. 16,000.

**Massula.** Spherical masses of micro-sporanges which float on the water; produced by certain plants of the natural family *Salviniaceæ*.

**Mastaba.** Bench-shaped tombs of the Old empire of Egypt, most numerous on the field of the great Pyramids and at Sakkarah.

**Mastax.** Chewing stomach or gizzard of Rotifers.

**Master.** 1. Of a ship, one in command. 2. In Chancery, assistant to the Chancellor, to hear references, etc. 3. Of the Rolls, an equity judge, with powers fixed by statute.

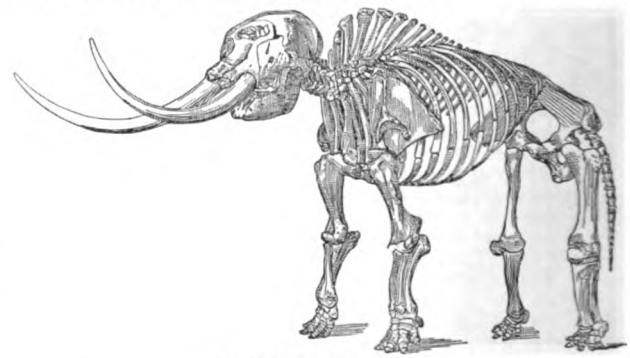
**Master and Servant.** The former has the legal right to direct and control acts on his behalf by the latter, and is liable to third persons for acts done by the latter within the scope of the business intrusted to him. This topic forms an extensive branch of the law.

**Mastic.** Resinous substance, the exudation of *Pistacia lentiscus*, found on the island of Chios and used in making picture varnish.

**Mastication.** First act in the process of digestion. The chewing and insalivation of food. It converts starch into a soluble sugar by a ferment present called Ptyalin.

**Mastiff.** Large dog, originally from Thibet, standing 30 in. high at shoulder. The color is buff, lips pendulous, muzzle thick, ears drooping, tail well developed. Being courageous, strong, and fierce, yet attached to its master and patient with children, it is prized as a watch-dog. From it has been bred the Bulldog and in turn the Pug.

**Mastodon.** Elephant-like Tertiary mammal with tuberculated teeth. It surpassed in size the existing elephant, and seems to have chiefly frequented temperate latitudes in both hemispheres. The species whose remains are most abundant in the U. S. is *M. americanus*, also called *M. giganteus* and *M. ohioticus*. Its remains are usually found in swamps: the first, disinterred in Mo., was bought for the British Museum. Another, found at Newburgh, N. Y., is in Dr. J. C. Warren's museum, Boston, Mass. The museum at Central Park, New York, State Museum at Albany, N. Y., Princeton Univ. Museum, Ohio State Univ., Rutgers Coll., Earlham Coll., and Field Columbian Museum, Chicago, each has a specimen. Over 20 species have been found represented in all continents. They begin in the Miocene and finally become extinct in the Pleistocene. Their tusks vary in curvature. The young and some adults had lower incisors. They have 6 molars, only 3 of which are in use at once, and the first three replaceable by a second set. The first molars have 1 or 2 ridges, the last 5 or 6, and the middle ones 3 or 4, according as the specimen is in the trilophodont or the tetralophodont series.



Mastodon americanus.

**Masuccio,** GUARDATO, d. 1499. Italian novelist.

**Masudi,** ABUL HASSAN ALI, d. 957. Arab traveler in then unvisited parts of Asia. His *Meadows of Gold* was partly tr. 1841.

**Matabeli.** Africans s. of the Zambesi, consisting of Zulus driven n. out of the region of the Transvaal republic by the great inroad of the Boers from Cape Colony 1838. They rose early in 1896, slew many whites, and caused much alarm for several months.

**Matadore Game.** Variety of dominoes. Instead of fitting the same numbers together, the players add a number which, when joined to the one already there, makes seven. The double blank, the four-three, six-one and five-two, are Matadores, and can be played at any time and either end turned outward at will for the opponet to play to. Three dominoes only are taken at the outset, and if a player cannot "go," he

must draw until he can. The game is played 30, 50, or 100 up, and the winner counts to his score his opponent's pips.

**Matagorda Bay.** In coast of Texas.

**Matamoros,** MARIANO, ab. 1770–1814. Mexican priest, leader in the rising against Spain; executed.

**Matanzas.** Seaport of Cuba, on the n. coast. Pop. ab. 56,000.

**Matapan,** CAPE. S. extremity of Greece.

**Match.** Combustible material, as cotton, hemp, tow, etc., soaked in some ignitible solution and then dried. Quick match, used for priming fuses, is made by soaking the material in a solution of gunpowder, mixed with gum arabic and water, and then coated with mealed gunpowder. Slow match is made of slightly twisted hemp rope soaked in lime-water and saltpeter and then dried. Its rate of combustion is about five inches an hour.

**Matches.** Phosphorus was first used for igniting other substances 1680. The first friction matches or lucifers were made 1827. They were tipped with sulphur and a mixture of gum, antimony sulphide, and chlorate of potassium. Phosphorus matches were first made in 1833. At present many different combustible mixtures are used in the manufacture; all contain phosphorus. A common one is composed of 3 parts chalk, ½ part lampblack, 5 parts glue, 1 part manganese dioxide, and 2–3 parts phosphorus. Safety matches usually consist of the chromate and chlorate of potash, minium and antimony trisulphide. The surface upon which they are ignited is made of antimony pentasulphide and red phosphorus.

**Mate.** An assistant. In the navy a petty officer. In the merchant service an officer; the first mate being next to the captain in command.

**Matè.** *Ilex paraguayensis.* Small tree of the Holly family, native of S. America, its leaves widely used as a tea; known as Paraguay Tea. It contains 0.13 per cent of caffeine, the active principle of tea and coffee.

Matè (*Ilex paraguayensis*).

**Matejko,** JAN ALOYSIUS, 1838–1893. Polish historical painter.

**Material Goods.** All useful material things, and rights to hold, or use, or derive benefits from them, or to receive them at a future time.

**Materialism.** Theory that regards all phenomena, physical and mental, as products of matter. It has two forms, cosmic and physiological, the former explaining the order of the world by a concurrence of atoms, the latter making consciousness a function of the brain. The doctrine is inconsistent with the immortality of the soul, unless consciousness be conceived as the function of a single indivisible atom assumed to be imperishable.

**Materials of Engineering.** The principal materials used in engineering constructions are timber, brick, stone, cast-iron, wrought-iron, and steel. In bridge construction cast-iron was mainly used prior to 1850, wrought-iron from 1850 to 1890, and steel since 1890. See STRENGTH OF MATERIALS.

**Material System.** Any distribution of matter the parts of which are so mutually dependent that any acceleration of its center of mass must be the result of the application of some force entirely external to the system. A single material particle is the simplest possible case.

**Materia Medica.** That branch of medicine which treats of the substances employed as remedies in the treatment of disease.

**Materna,** AMALIE, b. 1847. German dramatic soprano, who made her début as a soubrette in 1865, and was engaged at the Royal Opera in 1869. She was the original *Brünnhilde* at the first Wagner festival at Bayreuth, 1876, and came to New York 1884.

**Mathematics.** In ordinary acceptation, science which treats of the relations of quantities and the processes by which these relations are ascertained. Prof. Benj. Pierce gave a wider definition: "the science which draws necessary conclusions." Pure mathematics deals with abstract quantity and general relations: applied mathematics develops relations under specific existent conditions, and adapts principles to practical ends. Mathematics which deals with quantity expressed in numbers is arithmetic: that which treats quantity in figure and position is geometry: that which deals with quantity in symbols forming a language peculiar to itself is algebra. The various branches of mathematics, as trigonometry, calculus, etc., are set apart either by the nature of the conditions or the general character of the processes. The Higher Mathematics has the various titles of Analysis, Higher and Multiple Algebra, etc.

**Mather,** INCREASE, D.D., 1639–1723. Pastor in Boston from 1664, pres. Harvard 1685–1701, and a prolific writer. As agent of Mass. in England 1689–92, he obtained a new charter.—His son, COTTON, D.D., F.R.S., 1663–1729, was his colleague from 1684, and active in prosecuting witches. Chief among his many works is *Magnalia Christi Americana*, 1702. The two wielded a commanding influence in New England.

**Mather,** WILLIAM WILLIAMS, LL.D., 1804–1859. Assistant geologist to Featherstonhaugh to examine Wis. and Minn. 1835; Geologist of the First District of New York 1836; prof. in Ohio Univ. 1842–50. He pub. reports on the Geology of Ohio 1837–42.

**Matheson,** GEORGE, D.D., b. 1842. Pastor in Edinburgh from 1886, and a prolific writer, though blind from youth.

**Mathew,** THEOBALD, 1790–1856. Irish priest, who from 1838 conducted an effective crusade against intemperance at home and 1849–51 in America.

**Mathews,** CHARLES, 1776–1835. English comedian. His most eminent successes began 1818 with *At Home.*—His son, CHARLES JAMES, 1803–1878, was scarcely his inferior in light comedy.

**Mathias,** THOMAS JAMES, ab. 1754–1835. English poet and critic. *Pursuits of Literature*, 1794–97.

**Mathieu,** ANSELME, 1829–1895. Provençal poet.

**Mathilda,** 1046–1115. Countess of Tuscany; supporter of Gregory VII. in his contest with the emperors. Her large domains were given to the papal see.

**Mati,** TOMASO, b. 1825. Italian engineer, constructor of many harbors and lighthouses.

**Matico.** *Piper angustifolium.* Shrub of the Pepper family, native of S. America. Its leaves are used for stanching wounds.

**Matile,** GEORGE AUGUSTE, 1807–1881. Prof. Neuchatel 1838, Princeton 1855–58, and Univ. Pa. 1858–63; French writer.

**Matins.** In Music, the settings given to the versicles, responses, hymns and psalms which enter into the office proper to the first division of the canonical hours as established in the early Christian church and still followed by some monastic orders. Matins embrace the first three nocturnes and are followed by the lauds.

**Matrass.** Rectangular mass of fascines fastened together; used in the construction of jetties and for foundations in marshy soil, generally alternating with layers of stone. See LEVEES.

**Matrimony,** SACRAMENT OF. In R. C. theology, marriage between the baptized, as a relation dissoluble only by death, and the channel of supernatural graces.

**Matrimony Vine.** *Lycium vulgare.* Woody vine of the Potato family, native of Europe, introduced by cultivation into N. America; frequently met with in old gardens.

**Matrix.** 1. Rectangular array of elements similar to a determinant, but having the number of rows and columns unequal. 2. Rock material in which other mineral substances are embedded.

**Matsys,** QUENTIN, ab. 1466–1530. Leading Flemish painter of his time. Among his chief works are the *Descent from the Cross*, in the Antwerp Academy; *Money Changer and his Wife*, in the Louvre; *The Misers*, at Windsor Castle; *Madonna*, in Berlin.

The Misers, by Matsys.

**Matta,** GUILLERMO, b. 1829. Chilian politician and poet. *Poems*, 1880.

**Matter.** Substance which composes the universe external to consciousness and thus opposed to mind. The common conception of it is that it is the immediate object of the senses; the scientific conception is that it is the force which manifests itself in all recognized activities, whether in cosmic movements or in causing sen-

sations and consciousness. Tait defines matter as "whatever can occupy space." This clearly involves the general properties of volume and form, but does not indicate in any way what the ultimate structure or nature of matter is. There have been several hypotheses as to this. Democritus and Leucippus, ab. 500 B.C., suggested that all matter was made up of an infinite number of very small, hard, indivisible particles not in contact, which they called atoms. There were supposed to be as many kinds of atoms as there were different substances. This theory has not been refuted to the present day, though it seems highly improbable. Boscovich substituted for the atoms mere force centers but this hypothesis fails entirely to account for one of the most distinctive properties of matter; viz., inertia. The most recent theory is that propounded by Thomson, which supposes the smallest parts of a body to be endless vortex filaments of the æther. Such a vortex atom can be proved mathematically to have the following properties; it could come into existence only by some creative power; it would be indestructible and unchangeable in general form, though capable, by reason of its perfect elasticity, of vibrating in simple harmonic motion on either side of its normal position. These properties accord well with many of the results of experiment, but a full treatment involves mathematical difficulties of the profoundest character.

**Matter,** JACQUES, 1791–1864. Prof. Strassburg 1819–32 and 1846; critical and historical writer. *Gnosticisme*, 1828; *Mysticisme*, 1864.

**Matterhorn,** or MONT CERVIN. Peak of the Swiss Alps. Elevation 14,771 ft.

The Matterhorn.

**Matteucci,** CARLO, 1811–1868. Prof. Pisa 1840; Minister of Instruction 1862; writer on electricity and magnetism.

**Mattheson,** JOHANN, 1681–1764. German composer, singer, conductor, and writer on music. *Das neu-eröffnete Orchester*, etc., 1713; *Das beschützte Orchester*, 1717; *Der Vollkommene Kapellmeister*, 1739.

**Matthew.** One of the twelve Apostles, originally Levi, a tax-gatherer; author of the first Gospel, or of its Syriac original, probably ab. 65.

**Matthew** OF PARIS, ab. 1200–1259. Monk of St. Albans, author of a chronicle extending 1235–59.

**Matthew** OF WESTMINSTER. Imaginary chronicler, formerly credited with *Flores Historiarum*, which proves to be an abridgment of the work of Matthew of Paris.

**Matthews,** JAMES BRANDER, b. 1852. Prof. Columbia 1895. *French Dramatists*, 1881; *Americanisms and Briticisms*, 1892; *Royal Marine*, 1894; *Vignettes of Manhattan*, 1895; *His Father's Son*, 1896.

**Matthews,** STANLEY, LL.D., 1824–1889. Judge Cincinnati Court 1863; U. S. Senator 1877; Associate Justice U. S. Supreme Court 1881.

**Matthias,** ST. One of the twelve apostles, elected to Judas' place.

**Matthias,** 1557–1619. German Emperor 1612–19; brother and successor of Rudolf II.

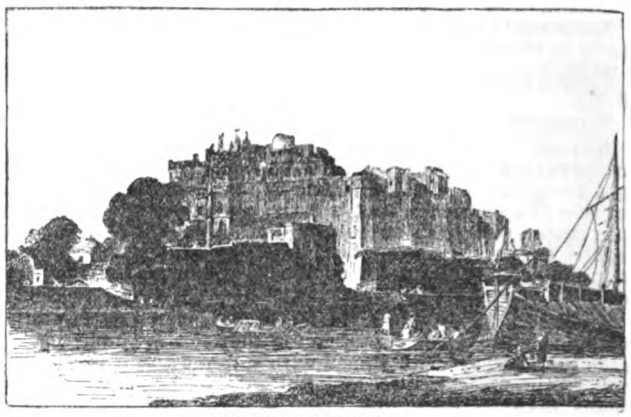
**Matthias Corvinus.** See CORVINUS.

**Matting.** Texture made by interweaving strips of reeds, the bark of trees, flags, grasses, rushes, rattan, etc. It is used in the packing of furniture, storing of grain on board ship, and in covering the floors of buildings. See JUTE.

**Mattioli,** PIERANDREA, 1500–1577. Italian botanist. *Compendium de plantis omnibus*, 1571; *De plantis epitome utilissima*, 1586; *Opera, quæ extant, omnia*, 1598. His works have been tr. into German and French.

**Mattock.** Engineering tool like a pickax, having broad sharp edges instead of points; used to cut roots and tangled undergrowth preliminary to excavation.

**Mattra,** or MUTTRA. Ancient city of India, on the Jumna; birthplace of Krishna; resort of pilgrims. The city is studded



Old Fort at Mattra.

with white edifices, giving it the appearance of a mud fortress. Pop., 1891, 60,020.

**Mattulla.** Fibrous masses at the base of the leaf-stalks in palms.

**Maturation of the Ovum.** Final steps of oögenesis, by which the egg becomes ready for development into an embryo; viz., extrusion of the POLAR GLOBULES (q.v.).

**Maturin,** CHARLES ROBERT, 1782–1824. Irish preacher of some note, author of *Melmoth*, 1820, and other wild romances, and of a successful tragedy, *Bertram*, 1816.

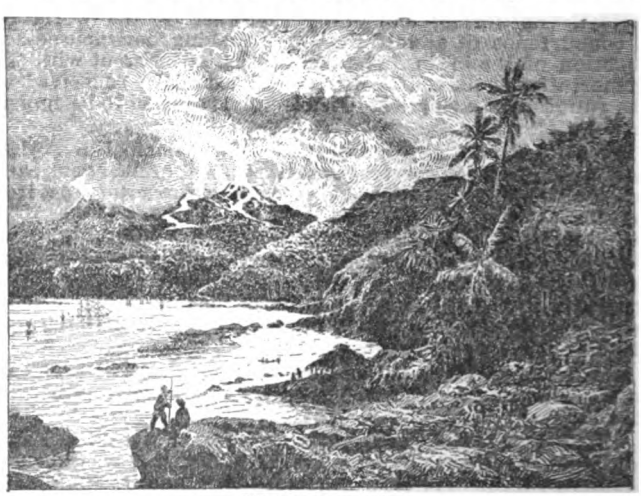
**Maud,** or MATILDA, ab. 1103–1167. Daughter of Henry I. of England; married to Henry, Emperor of Germany, 1114, and to Geoffrey Plantagenet, Count of Anjou, 1127; owned by her father (d. 1135) as his heir. Her title was disputed by Stephen of Blois; after a civil war, 1139–41, she was crowned in London, and ruled about 8 months, but withdrew to Normandy 1147.

**Maudsley,** HENRY, M.D., LL.D., b. 1835. Prof. Univ. Coll., London, 1869–79. *Physiology and Pathology of Mind*, 1867; *Body and Will*, 1883.

**Maulmain,** or MOULMEIN. City of Burmah, on the Bay of Bengal. It has a large trade. Pop., 1891, 57,920.

**Mauna Kea.** Volcanic summit of Hawaii, Sandwich Islands. Altitude 13,805 ft.

**Mauna Loa.** Volcano of Hawaii, largest and most active in the world. Its lava flow in 1855, covered 200 sq. m. with an



Mauna Loa, 1888.

average depth of 100 ft. In 1858 the lava stream half filled the Bay of Kiholo. Eruptions occurred also in 1888 and 1892. Altitude 13,600 ft.

**Maunder,** SAMUEL, ab. 1790–1849. Compiler, assisting William Pinnock, 1781–1843, in the preparation of his catechisms.

**Maundy Thursday.** Day before Good Friday.

**Maupassant,** GUY DE, 1850–1893. French novelist, pupil of Flaubert; chiefly known to English readers through his

short stories, which exhibit an exquisite mastery of style. His mind gave way 1892.

**Maupertius,** PIERRE LOUIS MOREAU DE, 1698–1759. French mathematician, chief of the expedition sent by Louis XV. to Lapland 1736 to measure an arc of the meridian. *Works*, 4 vols., 1752.

**Maurepas,** JEAN FRÉDÉRIC PHELIPPEUX, 1701–1781. French Prime Minister from 1774; author of the alliance with the U. S.

**Maurer,** GEORG LUDWIG VON, 1790–1872. Prof. Munich 1826; Minister of State; writer on history and jurisprudence.—His son, CONRAD, b. 1823, prof. Munich, is an authority on Iceland.

**Maurice,** PRINCE OF ORANGE and COUNT OF NASSAU, 1567–1625. Son of William the Silent, and his successor as Stadtholder of Holland 1584. After a rapid series of victories under his skillful generalship, the Dutch forced themselves from the power of Spain, which in 1609 acknowledged the independence of the United Provinces.

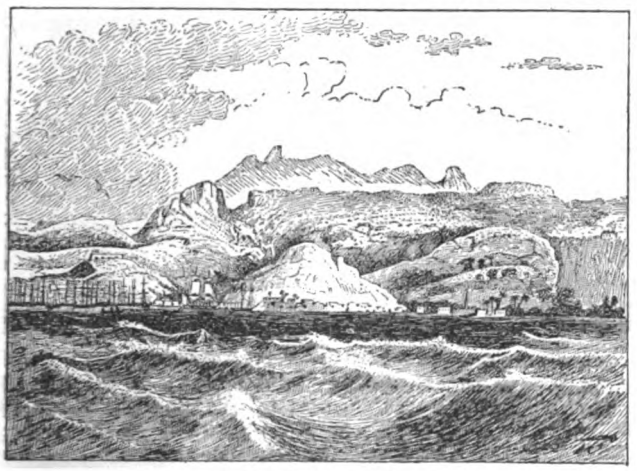
**Maurice,** JOHN FREDERIC DENISON, 1805–1872. Anglican divine, prof. London 1840–53, Cambridge 1866. Though never popular, his books exerted deep and wide influence on thinkers and teachers. Prominent among them are *The Kingdom of Christ*, 1838–42; *Religions of the World*, 1847; *Moral and Metaphysical Philosophy*, 4 vols., 1850–62; *Prophets and Kings of O. T.*, 1853; *Doctrine of Sacrifice*, 1854; *Conscience*, 1868.

**Mauricius,** FLAVIUS TIBERIUS, ab. 539–602. Byzantine Emperor from 582; deposed and beheaded.

**Maurists.** Benedictine order settled near Saumur 1618–1792; eminent for scholarship.

**Mauritania.** Country in n. Africa, corresponding to Morocco and part of Algeria; inhabited by the Mauri, an agricultural people. Claudius made 2 provinces of it 42; it was overrun by Vandals 429, by Arabs ab. 700.

**Mauritius,** or ISLE OF FRANCE. 550 m. e. of Madagascar; discovered by the Portuguese 1507; held by the Dutch and



Port Louis, Mauritius.

French, and since 1810 by the British. Capital, St. Louis, with pop. of 62,000. Area 705 sq. m. Pop. 1891, 377,986.

**Maury,** JEAN SIFFREIN, 1746–1817. French priest, noted for eloquence; Cardinal 1794, Abp. of Paris 1810–14.

**Maury,** JUAN MARIA, 1772–1845. Spanish poet, long exiled.

**Maury,** MATTHEW FONTAINE, U.S.N. and C.S.N., LL.D., 1806–1873. Supt. U. S. Naval Observatory 1844–61; prof. Lexington, Va., 1868. *Navigation*, 1835; *Physical Geography of the Sea*, 1855.

**Mausoleum.** Colossal tomb of King Mausolus of Caria, 377–353 B.C.; erected by his queen Artemesa at Halicarnassus. It is a complete ruin as to general form, but very important decorative reliefs, fragments of a quadriga, and the statue of Mausolus are in the British Museum.

**Mauthner,** LUDWIG, b. 1840. Prof. of Ophthalmology at Innsbruck 1869 and Vienna 1877; professional writer.

**Mauthner,** LUDWIG WILHELM VON, 1806–1858. Prof. of Pædiatrics at Vienna 1850. *Kinder-diatetik*, 1853.

**Mauvaniline.** See MAUVE.

**Mauve,** or MAUVEINE. $C_{27}H_{25}N_4Cl$. Product of the oxidation of aniline containing toluidine; red paste, soluble in water with difficulty; used only for violet inks. It was the first aniline color discovered by Perkin 1856, and has been known by many names. Its sulphate is known as Rosolan.

**Mavrocordato,** ALEXANDER, 1791–1865. Greek patriot, active in the war of independence; four times prime minister.

**Mawe,** JOHN, 1764–1829. English mineralogist. *Travels in Brazil*, 1812; *Diamonds*, 1813.

**Max,** GABRIEL, b. 1840. German artist. His works are showy and popular.

**Maxen,** BATTLE OF. In Saxony, Nov. 20, 1759; 12,000 Prussians surrendered to the Austrian General Daun.

**Maxentius,** MARCUS AURELIUS VALERIUS, ab. 282–312. Son of Maximian; Emperor at Rome 306; defeated by Constantine, and drowned in the Tiber.

**Maxilla.** 1. Upper jaw of vertebrates. 2. Two pairs of mouth appendages which lie posterior to the MANDIBLES (q.v.) in arthropods.

**Maxillipeds.** Jaw-feet of *Crustacea;* three pairs of feet lying between the great claws and the mouth in the crab and lobster. They serve the mouth as prehensile organs.

**Maxillo-Palatine Bar.** Cartilaginous bar in the skull of embryo vertebrates, which is the primitive form of the upper jaw.

**Maxima and Minima.** A function is a maximum for any value of its variable when at that value it is greater than for the values immediately preceding and following: it is a minimum for any value of its variable when for that value it is less than for those immediately preceding and following. Maxima and Minima values of some geometric functions may be found geometrically; but the calculus is usually employed.

**Maximianus,** MARCUS AURELIUS VALERIUS, called HERCULES, 250–310. Associated in the empire by Diocletian 286. He abdicated 305, and attempted to resume the purple 306 and 309.

**Maximianus,** GALERIUS VALERIUS, d. 311. Son-in-law of Diocletian; Cæsar 292, Augustus 305; chief mover of the terrible tenth Persecution of the Christians. Most of his coins were struck as Cæsar.

**Maximilian I.,** 1459–1519. Son of Frederick III.; German Emperor 1493; notable chiefly for his matrimonial alliances, which greatly enlarged the possessions of his house. Maxi-

Marriage of Maximilian I. with Mary of Burgundy 1478.

milian greatly encouraged the arts and learning, and caused *Theuerdank* and *Weisskunig* to be written, in both of which he is the hero.

**Maximilian II.,** 1527–1576. Son of Ferdinand I.; Emperor 1564; noted for his tolerance to Protestants.

**Maximilian** (FERDINAND MAXIMILIAN JOSEPH), 1832–1867. Austrian archduke, who on the French intervention in Mexican affairs 1862 was made Emperor of Mexico. From the commencement of his reign he found himself involved in difficulties; but, instead of resigning his crown according to the wishes of his friends, he stood by his troops in the contest with Juarez and the revolutionists. He was finally betrayed by one of his officers, hastily court-martialed, and shot with two of his generals, June 19, 1867.

**Maximinus,** CAIUS JULIUS VECUS, 173–238. Roman emperor 235–238; Thracian peasant; of huge size and enormous strength; savage, coarse and brutal; slain by his soldiers.

**Maximinus,** GALERIUS VALERIUS, "DAZA," d. 313. Son of Galerius; Cæsar 305; Emperor of the East 308; an odious tyrant.

**Maxims,** LEGAL. Short statement of a legal principle. Ab. 2,000 have been recognized by the courts; their value is questionable.

**Maximum Happiness.** See GREATEST HAPPINESS.

**Maximum Thermometer.** Automatic device in the form of a thermometer by which the highest temperature reached in any given interval of time is registered.

**Maximus,** VALERIUS. See VALERIUS.

**Maxwell,** JAMES CLERK, LL.D., F.R.S., 1831–1879. Prof. of Natural Philosophy in Mareschal Coll., Aberdeen, 1856, and in King's Coll., London, 1860–65; Prof. of Experimental Physics in Cambridge 1871. *Stability of the Motion of Saturn's Rings*, 1859; *Theory of Heat*, 1871; *Electricity and Magnetism*, 1873.

**Maxwell,** MRS. MARY ELIZABETH (BRADDON), b. 1837, m. 1874. English novelist. *Lady Audley's Secret*, 1862; *The Lovels*, 1871.

**Maxwell,** WILLIAM HAMILTON, 1794–1850. Irish writer, chiefly of military novels. *Life of Wellington*, 1839–41; *Hector O'Halloran*, 1844.

**Maxwell,** SIR WILLIAM STIRLING, 1818–1878. Scottish author, M.P. 1852–67 and 1872. *Artists of Spain*, 1848; *Velasquez*, 1855; *Cloister Life of Charles V.*, 1852; *Don John of Austria*, 1883.

**Maxwell's Color Disks.** Device employed by Clerk Maxwell to study the effects produced by mixing two or more of the elementary colors. Circles of colored paper are cut, and each one is slit along a radius. If these be slipped one within the other, the colors entering into the combination are proportional in amount to the area exposed. By causing the resulting surface to revolve very rapidly, the compound tint may be examined.

**May.** Fifth month of the year, so called from Maia, the mother of Mercury, to whom sacrifices were made on the first day. Considered the last month of spring in America and the Continent, but the first of summer in Great Britain.

**May,** CAPE. See CAPE MAY.

**May,** EDWARD HARRISON, 1824–1887. American historical and figure painter.—His sister, CAROLINE, b. ab.1820, has pub. much verse.

**May,** JOHN WILDER, 1819–1883. Chief-justice Municipal Court of Boston from 1873. *Insurance*, 1873; *Law of Crimes*, 1881.

**May,** SAMUEL JOSEPH, 1797–1871. New England Unitarian, earnest abolitionist. *Anti-Slavery Conflict*, 1868.—His cousin, SAMUEL, b. 1810, was active in the same cause.

**May,** THOMAS, 1594–1650. English dramatist, poet, and historian of the Long Parliament.

**May,** SIR THOMAS ERSKINE, 1815–1886. English official, knighted 1866, made Baron Farnborough 1886; author of *Law of Parliament*, 1844; *Rules House of Commons*, 1854; *Constitutional Hist. England*, 1861–63; *Democracy in Europe*, 1877.

**Maya.** Wife of Bramah, who, through her, created the universe. The term is also used in different senses in the theologies of India and Buddhistic legends.

**Mayaceæ.** Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Monocotyledons*, comprising one genus and ab. 7 species, all natives of America; called the Yellow-eyed Grass family.

**May Apple.** *Mandragora officinalis.* Herb of the Potato family, native of s. Europe and w. Asia; in N. America, *Podophyllum peltatum*, herb of the Barberry family, known as Mandrake.

**Maya-Quiché.** Natives of Yucatan and Guatemala. They were the first and most highly civilized nation of N. America, and perhaps from them came the stimulus that later resulted in the Toltec-Aztec civilization. Over 60 ruined cities lie in Yucatan, consisting of huge communistic or apartment palaces, constructed of huge squared stones, highly ornamented with square characters. Their alphabet has not yet been deciphered, though numerous attempts have been made; the latest by Le Plongeon, who claims to have discovered here the tomb of Abel and the legends of Genesis; he locates the Garden of Eden here, and derives the Old World alphabets from Maya characters. The papul vuh is a later work by a Quiché, who has recorded old traditions that are strangely like those in Genesis, but as the natives were all converted to Christianity by the Spanish invaders these stories may be borrowed from the Hebrew.

**Mayence.** See MAINZ.

**Mayer,** BRANTZ, 1809–1879. American writer on Mexico. *Captain Canot*, 1854.—His nephew, ALFRED MARSHALL, b. 1836, Prof. Univ. Md. 1856, Weestminster Coll. 1859–61, Pa. Coll. 1865, Lehigh Univ. 1866, Stevens Institute since 1871, has pub. *Earth a Magnet*, 1872; *Light*, 1877; *Sound*, 1878; and *Sport with Gun and Rod*, 1883.

**Mayer,** JOHANN FRIEDRICH, 1650–1712. Pastor at Hamburg 1686; Prof. Kiel 1688, and Greifswald 1701; noted for eloquence; voluminous writer.

**Mayer,** JOHANN TOBIAS, 1723–1762. Prof. Göttingen and director of the observatory 1751. He prepared tables for the motions of the sun and moon, of great accuracy for that day, in recognition of which his widow received £3,000 from the British Government.

**Mayer,** JULIUS ROBERT VON, 1814–1878. German physicist, ennobled 1876 for his discovery of the conservation of energy. *Dynamik des Himmels*, 1848; *Mechanik der Wärme*, 1867.

**Mayflower.** See ARBUTUS, TRAILING.

**Mayflower.** Ship of ab. 180 tons, in which the Pilgrims made the voyage from Southampton to Plymouth, Mass., landing Dec. 21 (11, O. S.), 1620. See FOREFATHERS' DAY.

**Mayfly.** See EPHEMERIDÆ.

**Mayhem.** Injury to any part of a man's body, rendering him less able to fight.

**Mayhew,** HENRY, 1812–1887. English author, first editor of *Punch*. *London Labor*, 1851.—His brothers, HORACE, 1816–1872, and AUGUSTUS SEPTIMUS, 1826–1875, were associated with his labors. THOMAS, b. 1810, and EDWARD, b. 1803, were also writers.

**May Laws.** Another name for FALK LAWS (q.v.).

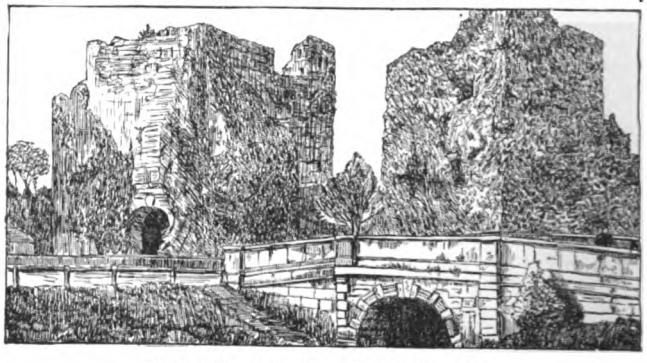
**Maynard,** GEORGE WILLOUGHBY, b.1843. N.A. 1885. American figure painter. His *Civilization* (ideal figure) is owned by the N. Y. Academy of Design and was exhibited at the World's Columbian Exposition, Chicago.

**Maynard,** HORACE, 1814–1882. Unionist of e. Tenn.; M.C. 1857–63 and 1866–75; U. S. Minister to Turkey 1875–80; Postmaster-gen. 1880–81.

**Maynard,** ISAAC HORTON, 1838–1896. Judge N. Y. Court of Appeals 1892.

**Maynard,** SIR JOHN, 1602–1690. Sergeant to the Commonwealth 1658; knight 1660; first Commissioner of the Great Seal 1689.

**Maynooth.** Village of co. Kildare, Ireland; site of a R. C. seminary for the training of priests, founded 1795; endowed by



The Castle of the Geraldines, Maynooth.

the State; the endowment capitalized 1869. It has ab. 500 students. M. Castle was stormed by the English, March 23, 1535, and 26 of its defenders hanged.

**Mayo,** FRANK, 1839–1896. American actor.

**Mayo,** RICHARD SOUTHWELL BOURKE, EARL OF, 1822–1872. Chief Sec. for Ireland 1852, 1858–59, and 1866–68; Earl 1867; Viceroy of India 1868.

**Mayo,** WILLIAM STARBUCK, M.D., b. 1812. American novelist. His *Kaloolah*, 1849, and *The Berber*, 1850, deal with n. Africa. *Never Again*, 1873.

**Mayonnaise.** Cold, thick sauce for meats and vegetables, made of the yolk of eggs, oil and vinegar, suitably seasoned with salt and spices.

**Mayor,** JOHN EYTON BICKERSTETH, b. 1825. Prof. Cambridge 1872; ed. *Juvenal* and the *Odyssey*.

**Mayow,** JOHN, 1645–1679. English medical writer, supposed to have anticipated much later discoveries in chemistry.

**Maypops.** Egg-shaped fruit of *Passiflora incarnata*, a vine of the Passion flower family, native of the s. U. S.

**May Weed.** *Anthemis cotula.* Ill-smelling weed of the Composite family, native of Europe, abundantly introduced into America, and troublesome and unsightly about barnyards and open places. It is extremely difficult of eradication, as it will grow and seed where grass is trodden out in places that it is undesirable to disturb with plow or cultivator.

**Mazarin,** JULES, 1602–1661. French statesman of Italian origin; Cardinal 1641. He succeeded Richelieu 1642, inheriting his policy and power. His arbitrary measures excited the Fronde wars, and he was forced to resign twice, but found in-

dispensable. He secured the interests of France in the Peace of Westphalia 1648, but his internal administration was inefficient.

**Mazarredo y Salazar,** José Maria, 1744–1812. Commander of the Spanish Navy 1793; Envoy to France 1799 and 1804; Minister of Marine under Joseph Bonaparte.

**Mazdak,** ab.470–ab.535. Persian heresiarch who held much power for a time and left many disciples.

**Mazeppa,** Ivan, 1644–1709. Polish noble, hero in youth of the adventure made famous by Byron. He became hetman of the Cossacks and Prince of the Ukraine, but conspired against the Czar and was overthrown.

**Mazères,** or **Masères,** Francis, 1731–1824. English lawyer, writer on mathematics and on Canadian topics.

**Mazuranic,** Ivan, b. 1813. Croatian poet and statesman, gov. of his province 1873–80.

**Mazurka.** Polish dance for 4 or 8 couples, usually in ¾ time.

**Mazza,** Angelo, 1741–1817. Italian lyric poet.

**Mazzini,** Giuseppe, 1805–1872. Italian patriot, who labored with unresting zeal for the freedom and unification of Italy. An outlaw and a fugitive, his busy brain hatched one conspiracy after another; and while his schemes generally failed, with much loss of valuable lives, they had an educational influence, and contributed to the attainment of their end by other means. His writings were collected in 18 vols. 1861–91.

**Mazzoni,** Guido, ab. 1450–1518. Italian sculptor.

**Mazzoni,** Guido, b. 1859. Italian poet, prof. Padua 1887.

**Mazzuoli,** Francesco, 1503–1540. Italian painter.

**Mead,** Hydromel, or Metheglin. Beverage made of honey and water, fermented; used by the ancients and by the Norsemen.

**Mead,** Larkin Goldsmith, b. 1835. American sculptor. His monument to Lincoln was placed at Springfield, Ill., 1874.

**Mead,** Richard, M.D., F.R.S., 1673–1754. Physician to George II.; of high repute and great influence. *Poisons*, 1703; *Medicina Sacra*, 1749; *Works*, 1762.

**Meade,** George Gordon, U.S.A., 1815–1872. Brig.-gen. Vols. 1861, Major-gen. 1862; distinguished at Fredericksburg; commanding Army of the Potomac from June 28, 1863; victor at Gettysburg, July 1–3.—His father, Richard Worsam, 1778–1828, was U. S. Navy agent at Cadiz 1805–16, and advanced large sums to the Spanish government, which were never paid.

**Meade,** William, D.D., 1789–1862. Asst. Bp. of Va. 1829, Bp. 1841. *Old Churches, Ministers, and Families of Va.*, 1857.

**Meadow.** Low level land devoted to the culture of grass. In its restricted sense it is implied that the grass is to be mowed and not grazed by cattle.

**Meadow Beauty.** Species of the genus *Rhexia*, showy-flowered marsh plants of the natural family *Melastomaceæ*, natives of the e. U. S.; known as Deer Grass.

**Meadow Grass.** Grasses of the genus *Poa*, of wide geographical distribution; called also Spear Grass.

**Meadow Grass,** Fowl. See Red Top, False.

**Meadow-Rue.** Plants of the genus *Thalictrum*, large herbs of the natural family *Ranunculaceæ*, with decompound leaves; of wide geographical distribution.

**Meadow Sweet.** Shrubs of the genus *Spiræa*, of the Rose family, natives of the n. hemisphere, widely cultivated for their showy flowers.

Meadow Sweet (*Spiræa filipendula*).

**Meadville.** City in Crawford co., Pa., 34 m. s.w. of Erie. Pop., 1890, 9,520.

**Meagher,** Thomas Francis, 1823–1867. Irish Fenian, transported 1849 to Van Diemen's Land. He escaped 1852 to the U. S., and was a brig.-gen. U. S. Vols. 1862.

**Meal-Tub Plot.** Fabricated for notoriety by Thomas Dangerfield (1650–1685) 1679; he asserted that Presbyterians were conspiring for a republic, and in 1685 accused the Roman Catholics of designs upon the life of James II. He was whipped at Tyburn, and when returning killed by a bystander.

**Meander.** Greek fret or key pattern, derived from Egypt and then found in tomb patterns dating over 2500 B.C. at Beni Hassan and Siout.

**Mean Free Path.** Average distance a gas molecule travels between two consecutive collisions with its fellows. That of hydrogen seems to be the longest; *i.e.*, from 0.00005 mm. (Maxwell), to 0.0001 mm. (Crookes).

**Meanness.** Vice antithetical to liberality, and consisting in the choice of a trifling gain for one's self rather than the exercise of justice and benevolence to others.

**Mean Proportional** of two Quantities. Such a quantity that the first of the given quantities is to it as it is to the second: if $\frac{a}{b}=\frac{b}{c}$ b, is a mean proportional between a and c. In such case $b^2=ac$: c is called a third proportional to a and b.

**Means.** Action taken to attain a given end.

**Mean Velocity** of a Stream. Such that the product of it and the area of the cross-section gives the discharge. If a be the area of the cross-section, p the length of its wetted perimeter, l the length of a portion of the stream, and h the fall in that distance, the formula

$$v=c\sqrt{\frac{a\,h}{p\,l}}$$

gives the mean velocity, where c is a constant whose value ranges from 60 to 120 when the given data are expressed in feet. The variation in the value of c is largely due to the variable degrees of roughness of the beds of streams.

**Meares,** John, ab. 1755–1809. English sailor, who visited Alaska 1786, seized certain lands, and was embroiled with Spain. *Voyages*, 1790.

**Measles** (Rubeola). Acute, highly infectious disease, characterized by an initial coryza, a continued fever, and an eruption which appears about the fourth day, first on the face and rapidly spreads over the body. The rash at first papular soon forms blotches. The disease is most common in childhood, and occurs in epidemics. There may be a second and even third attack. Simple cases generally recover. The most frequent and fatal complication is the extension of the existing bronchitis to the finer bronchial tubes, causing collapse or broncho-pneumonia. Treatment: confinement to bed, milk diet, warm drinks, bowels regulated and tepid baths, is all that is necessary in mild cases.

**Measure.** In popular musical phrase, a dance-piece; in musical terminology the space on a staff inclosed by two contiguous perpendicular lines called bars; also the group of time units within the space which form a standard for the regulation of the rhythmical structure of a composition.

**Measure.** Result of comparing any physical quantity with a unit quantity of the same kind. Two cases present themselves: (1) that in which the measure is a concrete physical quantity consisting of two parts, viz., the unit quantity employed and the numerical part expressing the number of times the unit is contained in the quantity measured; (2) that in which the result is merely a number. The measurement of a certain length gives a result under the first case; the determination of a specific heat, under the second case.

**Measure of Value.** Commodity in terms of which the value of all other goods is estimated; common denominator or common measure of value; generally considered as one of the properties of money.

**Measures.** In Geology, succession of strata, chiefly coal.

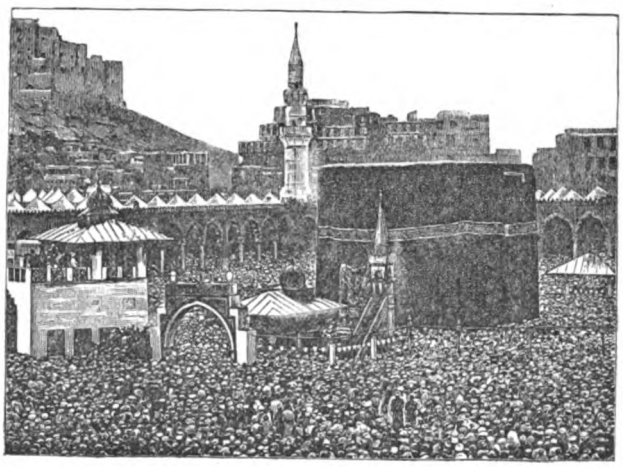
**Measuring Machine.** See Comparator.

**Meat.** Flesh of vertebrate animals used as food; also formerly applied to food in general. Meat extracts are preparations containing the essential nutritive elements of meat. Meat poisoning is caused by the ingestion of meat contaminated with toxic substances. It occurs most frequently from sausage and canned meats. See Beef, Ptomains, Trichina, Extracts of Meat.

**Meats,** Law of. Restrictions in the Mosaic Law, forbidding to Israelites the use of flesh except of animals which chew the cud and divide the hoof, and of fish except such as have fins and scales. The effect of this was largely to isolate Israel during the long period of its specific development.

**Mecca.** Capital city of Arabia; birthplace of Mohammed and center of the religion of Islam; containing the Káaba and the Mosque El Haram; besieged by the Omeyyads 692; pillaged by the Carmathians 930; passed to the Turks 1517; sacked by the Mahabees 1803, who were driven out by Me-

hemet Ali 1818. It is visited by 200,000 pilgrims annually. Pop. ab. 60,000.



Pilgrims round the Káaba.

**Mecca Balsam.** Name given to BALM OF GILEAD (q.v.).

**Mechanical Advantage.** Utility of a machine as measured by the ratio of the resistance overcome to the least force which it is necessary to apply to it. This ratio is evidently the same as that of the distance traveled by the power to that traveled by the weight. Thus there is no creation of energy, but merely a transfer of the constant product FS (force x distance) in such a way that by making S smaller, F may be made larger.

**Mechanical Engineering.** The art of designing, building, and operating machinery so as to perform its work in the most economical manner. Since machinery is driven by motors the theory of steam boilers and engines, as well as of water wheels and air and gas-engines, forms the foundation of successful practice in mechanical engineering. Mechanics was first methodically applied to the study of machinery about the beginning of the present century, although the theory of the lever, inclined plane, and pulley, had been known since the time of Galileo. The development of the steam engine and the introduction of railways gave a powerful impetus to mechanical pursuits. For a long time civil and mechanical engineering were regarded as one profession, but since 1870 a rapid differentiation has taken place, particularly in the U. S. Distinct courses of study in mechanical engineering are now given in all technical schools, and several institutions are devoted to it alone. The American Society of Mechanical Engineers, founded in 1880, has nearly 2,000 members and publishes annually a volume of papers and discussions. The field of mechanical engineering is now so extensive that the successful practitioner must devote himself to a specialty; thus we have steam, electric, and marine engineers, as well as those who are experts in particular lines, like machinery for the manufacture of cotton or silk. Success in a specialty, however, can best be secured by a young man who has a broad foundation in the fundamental principles of general engineering, theory and practice.

**Mechanical Equivalent** OF HEAT. See HEAT and JOULE'S EQUIVALENT.

**Mechanical Equivalent** OF LIGHT. According to Thompson, the light given by a standard candle per minute is equivalent to 12 foot pounds of work. See CANDLE POWER.

**Mechanical Powers.** See ELEMENTARY MACHINES.

**Mechanical Theory** OF HEAT. See THERMODYNAMICS.

**Mechanics.** Science which treats of the action of forces on bodies; divided into statics, the principles and propositions applicable to bodies at rest under action of forces, and dynamics, referring to principles of equilibrium and action of bodies in motion; also divided into mechanics of solids and of fluids, which latter is divided again into pneumatics and hydromechanics, for gases and liquids respectively. See KINEMATICS and DYNAMICS.

**Mechanics,** ANIMAL. According to modern Biology, an animal is a machine under guidance of Life, or what has erroneously been termed Vital Force, for this guiding principle is not convertible into other forces, nor is it involved in the transformations of energy that manifest the life of the body. A living body is an engine plus an engineer. All the physical, chemical and mechanical activities of the body are as completely material energies as in the case of an automaton. The vital principle which resides in the protoplasm is an educable something which determines how energy shall be transformed under the conditions that occur and that affect the well being of the organism. Structurally the body is a very complicated mechanism; but physiologically its machinery corresponds to the organization of a highly civilized human society. Each biological cell corresponds to an individual; and the body is a sociological organization of these into a cell-state.

**Mechanicsville** (or BEAVER DAM CREEK), BATTLE OF. Near Richmond, Va. Part of Lee's army under Longstreet and A. P. Hill were defeated by Federals under Fitz John Porter, June 26, 1862; loss of the former 4,000, of the latter 400.

**Mechitarists.** See MEKHITARISTS.

**Mechlin.** See MALINES.

**Meckel's Cartilage.** Forming the axis of the lower jaw in embryos, and about which the true lower jaw bones form.

**Mecklenburg Declaration of Independence.** Said to have been issued at Charlotte, N. C., May, 1775; first pub. 1819. Its authenticity is disputed.

**Mecklenburg-Schwerin.** Grandduchy of n. Germany. Area 5,135 sq. m.; pop., 1890, 578,342.

**Mecklenburg-Strelitz.** Grandduchy of n. Germany. Area 1,131 sq. m.; pop., 1890, 97,978.

**Meconidium.** Peculiar sporosac borne on the summit of the gonangium of *Gonothyrea*, one of the Hydroids.

**Meconin.** $C_{10}H_{10}O_4$. Opianyl. Anhydride of meconinic acid. Neutral substance in opium, crystallizing in hexagonal prisms.

**Medal.** Piece of metal, struck in the form of a coin to commemorate some illustrious action or important event, and conferred upon individuals for distinguished services. The list

Medal commemorating the visit of John VIII. to Florence 1439, by Pisano.

of officers and enlisted men still in the U. S. service to whom medals of honor have been awarded is borne upon the annual Army Register.

**Medary,** SAMUEL, 1801–1864. Ohio journalist, Gov. of Minn. 1857–58, and of Kan. 1859–60.

**Medea.** Daughter of King of Colchis, skilled in magic. She aided Jason to take away the Golden Fleece.

**Medes.** Race whose early history is obscure. Their empire was founded by Deioces 700 B.C., and reached its height of power under Cyaxares 625–585, who, aided by the King of Babylon, destroyed Nineveh ab. 607 and overthrew the Assyrian empire; it was ended, or rather transformed, by Cyrus's overthrow of Astyages 550. Media fell into the hands of Alexander, then of the Seleucidæ, and was conquered by Parthians in 2d century, B.C.

**Medford.** Suburb of Boston, founded 1630, chartered as a city 1892. Pop., 1890, 11,079.

**Medhurst,** WALTER HENRY, 1796–1857. English missionary to Java and China; translator and author. *China*, 1838; *Chinese Repository*, 20 vols., 1838–51; *Chinese Dictionary*, 1842–43.

**Mediæval Art,** 400–1600. It began with the German invasions of West-Roman territories, and ended with the Renaissance. It is generally distinguished by more or less indifference to formal beauty and to scientific design, due to the influence of barbarism, to early Christian indifference to beauty, to the Christian destruction of Pagan art, and to the Roman decadence. It had great decorative value, and shows much sincerity and serious purpose, being wholly religious in origin and character. See also BYZANTINE, ROMANESQUE, and GOTHIC ART.

**Medial** (or MEDIAN) **Line.** One drawn midway of other lines. The medials of a triangle are the lines drawn from the vertices to the middle of the opposite sides.

**Medial** (or MEDIAN) **Point.** Point where the three medials (or medians) of a triangle meet; also point equidistant from others.

**Medical Corps,** U. S. NAVY. This consists of 1 surgeon-gen. (with relative rank of commodore), 15 med. directors (captains), 15 med. inspectors (commanders), 50 surgeons (lieut.-com.), 56 passed asst.-surg. (lieuts.), 22 asst. surg. (ensigns).

They are retired at the age of 62 or after 45 years' service, with 75 per cent of sea pay.

**Medical Department.** In the U. S. Army; charged with investigating the sanitary condition of the army, caring for the sick and wounded, making physical examinations of officers and men, and furnishing all medical and hospital supplies for the personnel of the army. It consists of one surgeon-general (brig.-gen.), six assistants (colonels), ten deputies (lieut.-colonels), 50 surgeons (majors), 74 assistant surgeons (captains), 36 assistant surgeons (first lieutenants), 112 hospital stewards, 78 acting stewards, and 516 privates of the hospital corps. Retired at age of 64 or after 30 years' service, with 75 per cent of pay.

**Medical Electricity.** Static, Galvanic and Faradic electricity are employed in medicine. Static or frictional is little used. Galvanic, generated by chemical action, is employed in a large variety of diseases. For general purposes a battery of 40 cells, giving a pressure of about 50 volts, is necessary. For the electrolysis of tumors, etc., a current of greater density and volume is required. Faradic is an induced current, and passes in both directions. This form is more applicable where a tonic effect is desired. Galvano-cautery, a platinum wire heated by a galvanic current of low tension, is used for surgical purposes. See X-RAYS.

**Medici.** Family brought to power in Florence by COSIMO, 1389–1461.—His grandson, LORENZO, 1448–1492, was a patron of letters, a dabbler in verse, and an astute politician.—COSIMO, 1519–1574, became Grandduke 1569. The house survived till 1743, and produced three popes and two queens of France.

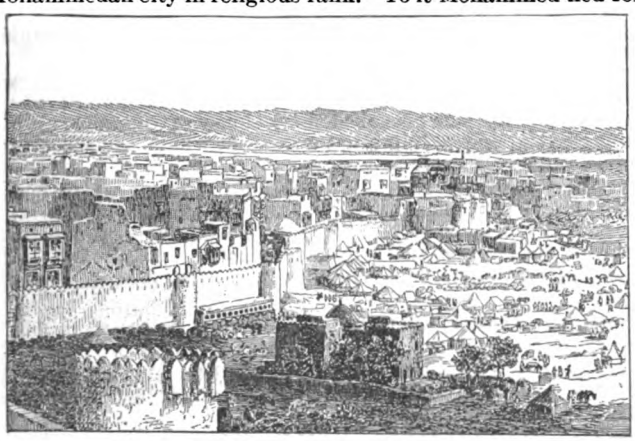
**Medicine.** The art and science of healing and curing disease. The early history is legendary. According to Homer, Æsculapius appears as an excellent physician of human origin, and becomes the god of the healing art. The knowledge of medicine from then to near the 19th century remained almost purely hypothetic and empiric. It is only within the last century, especially the last quarter, of scientific research, that medicine has approached an exact science and true art. The study of medicine includes anatomy, physiology, pathology, bacteriology, hygiene, chemistry, materia medica, therapeutics, surgery and obstetrics.

**Medick.** Herbs of the genus *Medicago*, of the natural family *Leguminosæ*, mainly natives of Eurasia, widely distributed as weeds. The Black Medick (*M. lupulina*) is the commonest species, and is locally known also as Nonesuch. *M. sativa* is cultivated for fodder as Lucerne.

**Medikus,** FRIEDRICH CASIMIR, 1736–1809. Director of the Gardens at Mannheim. *Philosophische Botanik*, 1789–91; *Ueber Nordamerikanische Bäume und Sträucher*, 1792; *Beiträge zur Pflanzenanatomie, Pflanzenphysiologie, etc.*, 1799–1801.

**Medill,** JOSEPH, b. 1823. Ed. Chicago *Tribune* since 1855; Mayor of Chicago 1871.

**Medina.** Arab. Medinet-al-Nabi, one of the holy cities of the Mohammedans, 255 m. n. of Mecca, on the Red Sea. Second Mohammedan city in religious rank. To it Mohammed fled for



Medina.

refuge 622, the epoch of the Hegira: his tomb adjoins the great mosque, which is built on the reputed spot where Mohammed died.

**Medina.** Massive sandstone near the middle of the Silurian system in the n.e. U. S. See SILURIAN.

**Medina,** JOSÉ MARIA, 1815–1878. Pres. of Honduras 1864, 1866, and 1870; executed.

**Medinet Abu.** Site of a Theban temple ruin dating from Rameses III., ab. 1270 B.C.; better preserved than the great Hall of Karnak, and more imposing than Edfou.

**Meding,** OSCAR ("G. SAMAROW"), b. 1829. German historical novelist; Hanoverian Counselor 1859–70. *Scepter and Crown*, 1872, tr. 1875; *Memoirs*, 1881–84.

**Mediterranean Sea.** Arm of the Atlantic, separating Europe from Africa. It is 2,200 m. long, 100 to 650 m. wide, and has an area of ab. 950,000 sq. m. The depth ranges from 200 to 2,000 fathoms. It is connected with the Atlantic by the Strait of Gibraltar, but 12 m. wide and relatively shallow. The M. receives the waters from more than 2,000,000 sq. m. of land, yet evaporation from its surface more than offsets what it receives. There is a constant inward current through the straits, and the water is slightly more saline than that of the Atlantic.

**Medium.** That through which any physical phenomenon takes place. Thus the hypothetical æther is the medium through which radiant energy is propagated. Sound waves are transmittted through elastic bodies, the matter composing the bodies forming in each case the medium.

**Medium of Exchange.** Commodity which every one shall freely receive in exchange for what he possesses but does not desire to consume, in the assurance that in the future with it he can command from others what he may want.

**Medlar.** *Mespilus germanica.* Small tree of the natural family *Rosaceæ*, native of Europe, bearing an edible fruit the size of a very small apple. The Neapolitan Medlar is *Cratægus azarolus*, of the same family, and produces a similar fruit.

**Medley,** SAMUEL, 1738–1799. Hymnist; Baptist minister at Liverpool from 1772.

**Medoc.** See CLARET WINES.

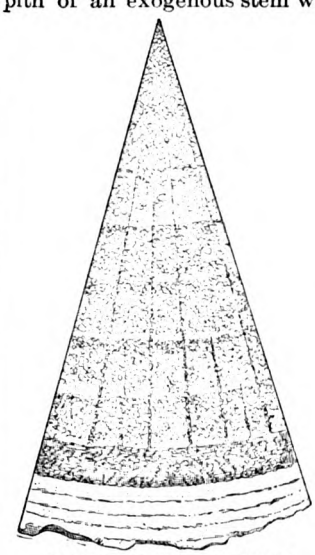
**Medrano,** FRANCISCO, ab. 1600. Spanish poet, whose effusions appeared 1617.

**Medulla.** See PITH.

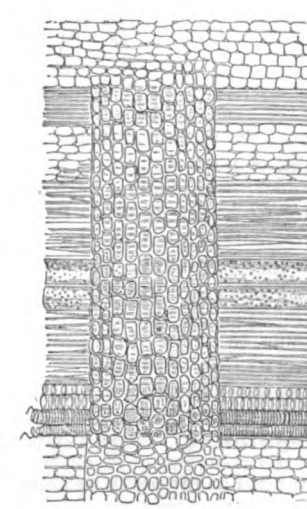
**Medulla Oblongata.** The upper enlarged part of the spinal cord, extending from the upper border of the atlas to the lower border of the pons varolii. It is an inch and a quarter long, and rests on the basilar groove of the occipital bone.

**Medullary Folds.** Two folds formed along the back of vertebrate embryos. They grow up and unite, at the same time inclosing the groove between them as a canal. This is the central canal, which widens out in front to form the ventricles of the brain; the substance of the folds themselves becomes the central nervous system, brain, and spinal cord.

**Medullary Rays.** Plates of parenchyma connecting the pith of an exogenous stem with the bark. When prominent



Medullary rays of the Cork-tree (horizontal section).



Medullary rays of the Maple.

they form the silver grain of certain woods. There are two kinds, the primary, extending from the pith to the cortex, and the secondary, which are shorter.

**Medullary Sheath.** Layer of ducts with spiral or annular markings, immediately surrounding the pith of an exogenous stem.

**Medulla Spinalis.** See SPINAL CORD.

**Medum.** Egyptian site ab. 25 m. s. of Cairo, on w. bank of the Nile, where there is a step-shaped pyramid dated by Petrie in 1891 to King Senefru, who slightly antedates Shufu (Cheops). At the foot of this pyramid Petrie found a small temple buried under rubbish fallen from it, the oldest dated building in the world. It is of plain construction, with two short obelisks, having rounded tops on the side facing the pyramid.

**Medusa.** Jellyfish; bell-shaped, gelatinous animal, which

in many cases has been set free as a bud from a hydroid colony, and which produces the eggs or spermatozoa. In some groups of Cœlenterates the eggs of the Jellyfish develop directly into the mature Medusa form without passing through a stage of hydroid budding.

**Medusa.** See GORGONS.

**Medusidæ.** See ACALEPHS.

**Meek,** FIELDING BRADFORD, 1817–1876. Assistant to D. D. Owen on the Geological Survey of Iowa, Wis. and Minn.; afterward to Prof. Hall at Albany; student of the Paleontology of Ill. and Ohio and the Tertiary fossils of the Upper Mississippi.

**Meekness.** Disposition under the influence of which anger and resentment are repressed, and tranquillity preserved, notwithstanding the provocations of insult or injury.

**Meerschaum.** $H_4Mg_2Si_3O_{10}$. Fine-grained, earthy mineral, rather soft and light; in composition, a hydrous magnesium silicate, derived from the decomposition of older magnesian rocks. Its mineralogical name is Sepiolite. The chief supply comes from Asia Minor, Spain, and Morocco. It was formerly much used for tobacco pipes.

**Meerut.** City of British India, 38 m. n.e. of Delhi; memorable for the revolt of native troops and massacre of Europeans, May 10, 1857. Pop., 1891, 119,390.

**Meeting,** QUARTERLY. In Methodism, held under the Presiding Elder: in Quakerism, a union of several Monthly Meetings.

**Megaceros.** Group of large deer-like Pliocene Ruminants, characterized by a form of antler unknown among existing

The "Irish Elk" (*Megaceros hibernicus*), Post-Pliocene.

species of deer; commonly but erroneously called the Irish Elk; true deer, intermediate between the fallow and the reindeer.

**Megacheiroptera.** See BATS.

**Megacles,** 6th cent. B.C. Athenian opposed to Pisistratus.

**Megadermidæ.** See BATS.

**Megadyne.** See FORCE.

**Megalensia,** MEGALESIA, or MEGALENSES LUDI. Festival at Rome, in honor of Cybele; celebrated in April.

**Megalerg.** See ERG.

**Megalithic Monuments.** See DOLMEN, MENHIR, STANDING STONES and STONE CIRCLES.

**Megalonyx.** Huge Tertiary edentate mammal, so called from the great size of its claw. It chiefly inhabited S. America, but ranged as far north as Ohio.

**Megalops** (MEGALOPA). Last stage in the series of larval forms that succeed each other in the development of a Crab (*Brachyura*). It resembles the *Macrura* (Lobsters) in having a tail or abdomen consisting of six well-developed segments.

**Megalosaurus.** Gigantic, powerful, carnivorous Dinosaur with formidable teeth, supposed to have walked on its hind feet only.

**Megaphone.** Instrument invented by Edison 1878 for assisting hearing. It consists of two large funnels with elastic conducting tubes from their apices to the ears. A single funnel is used to speak to persons at a distance. Conversation in a moderate tone has been understood at a distance of a mile and a half.

**Megaphyton.** Carboniferous genus of tree-ferns with two rows of great leaves, one at each side of the stem, which was probably sustained by large bundles of aerial roots.

**Megapodiidæ** (MOUND BIRDS). Family of Australian gallinaceous birds having long legs, a broad tail, large walking feet, in which the hind toe is on a level with the others. They make mounds six or more feet high and often thirty feet in diameter, in which they bury their eggs to be hatched by the heat produced by the fermentation of the vegetable matter in the mass.

**Megara.** Capital of Megaris, a district of Greece between Attica and Corinth; prosperous 700–500 B.C.; held by Athens 461–445.

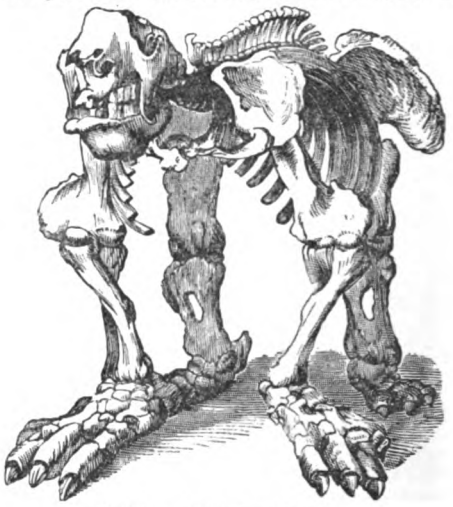
**Megascleres.** Large spicules of sponges. The rhabdus, triod, triæne, hexactine, and most of the monaxial and triaxial systems of spicules are examples.

**Megascope.** See MAGIC LANTERN.

**Megaspore.** Larger of two kinds of spores borne by heterosporous *Pteridophyta*, and by *Sphagna*. See MACROSPORES.

**Megasthenes.** Envoy of Seleucus to a prince on the Ganges ab. 305–297 B.C.; author of *Indika*, of which fragments remain.

**Megatherium.** Gigantic fossil Sloth found in S. America from the post-pliocene period. It was not so tall as the elephant, but quite as massive. Skeletons 18 feet long have been found. The hind feet possessed one toe less than the front. It belongs



Skeleton of the Megatherium.

to the family of fossils known as *Gravigrada*, including also *Mylodon* and *Megalonyx*. Owen maintained that this creature by resting on its two hind legs and massive tail was able to break down the branches of trees and browse upon the leaves.

**Megavolt.** See VOLT.

**Megerg.** See ERG.

**Megohm.** See OHM.

**Megrinine.** Citrates of caffeine and antipyrine, administered to relieve headache.

**Mehemet Ali,** 1769–1849. Viceroy of Egypt 1806. He destroyed the Mamelukes 1811, introduced reforms, and evoked great prosperity, but provoked the jealousy of the Porte by invading Syria, and precipitated a conflict which the intervention of the Great Powers terminated.

**Méhul,** ETIENNE NICOLAS, 1763–1817. French opera composer, member of the Academy 1795. His *Joseph*, 1807, is still occasionally performed in France and Germany. The overture to his *Jeune Henri* is also sometimes heard.

**Mei,** LYOFF, 1822–1862. Russian dramatist, poet, and translator.

**Meiggs,** HENRY, 1811–1877. Builder of railways in Chili and Peru; beautifier of Lima.

**Meignan,** GUILLAUME RENÉ, 1817–1896. Bp. of Chalons 1864, of Arras 1882, Abp. of Tours 1884, Cardinal 1893. *Prophets*, 1858–92; *Rénan Refuted*, 1863.

**Meigs,** CHARLES DELUCENA, M.D., 1792–1869. Prof. of Obstetrics in Jefferson Coll., Phila., 1841–61; eminent as a teacher and professional writer.—His son, MONTGOMERY CUNNINGHAM, U.S.A., 1816–1892, constructed the Washington Aqueduct 1852–60, and was Quartermaster-gen. 1861–65.

**Meigs,** RETURN JONATHAN, 1765–1825. Chief-justice of Ohio 1803; U. S. Senator 1808–10; Gov. of Ohio 1810–14; U. S. Postmaster-gen. 1814–23.

**Meilhac,** HENRI, b. 1831. French dramatist, associated with Ludovic Halévy. *Frou-frou*, 1869.

**Meineke,** AUGUST, 1790–1870. Teacher in Berlin; editor of Greek texts.

**Meiobar.** Area of low barometer, or when the pressure is below 760 millimeters; so named by Prestel 1870.

**Meiophylly.** Suppression of one or more leaves of a verticil, either of the stem of a plant or of the flower.

**Meiostemanous.** Flowers having more petals than stamens.

**Meiotaxy.** Suppression of a circle of parts in the flower, as the corolla in Anemone.

**Meisir.** Game of the heathen Arabs, forbidden with wine by Mohammed; played with marked arrows which were shaken at random from a quiver. The invariable stakes were camels, which were afterward killed and eaten. The meisir was always played in winter. The term afterward became a general one for gambling.

**Meissen,** HEINRICH VON, ab.1250–1318. Minnesinger, known as Frauenlob.

**Meissner,** ALFRED, 1822–1885. Austrian poet, dramatist, and novelist. *Ziska*, 1846.

**Meissner,** CHARLES FRÉDÉRIC, 1800–1874. Swiss botanist; Prof. at Basle. *Plantarum vascularum genera*, 1836–43; *Polygonaceæ*, 1856–64.

**Meissonier,** JEAN LOUIS ERNEST, 1815–1891. French genre painter, whose works are renowned for painstaking minuteness and accuracy as well as for good color, and have brought enormous prices. *Napoleon at Friedland*, known as *1807*, is an important possession of the Metropolitan Museum of New York.

**Meistersinger.** Guild of poets made up of German handicraftsmen, which flourished for several centuries. They claimed to have been founded by Frauenlob in the 13th century, and to be the successors of the Minnesinger and practiced poetical composition by rule of thumb. The principal seats of the guild were Strasburg, Frankfort, Würzburg, Zwickau, Prague, Nuremburg, Munich, and Ulm; at Ulm the guild maintained a nominal existence till 1839. The most famous of meistersingers was Hans Sachs, 1494–1576, the cobbler poet, who is the hero of Wagner's only comic opera, *Die Meistersinger von Nürnburg*.

**Meister Stephan.** See LOCHNER, STEPHAN.

**Meister Wilhelm,** d. 1378. Painter of the Cologne school, 1358–72, first known and best of his day. Several of his paintings are in Cologne churches.

**Meitzen,** AUGUST, b. 1822. German statistician, Prof. Berlin 1875. *Urkunden Schlesischen Dörfer*, 1863; *Der Boden und der Landwirthschaftlichen Verhältnissen der Preussischen Staats*, 1868–71; *Geschichte, Theorie, und Technik der Statistik*, 1886.

**Mekhitarists.** R. C. order founded 1701 by an Armenian, Mekhitar, or Manuk, 1676–1749. His monastery and school were in Morea 1703–15, and then on San Lazzaro I., under protection of Venice, where much printing has been done.

**Mekong,** or CAMBODIA. River of s. Asia. It heads in China

Cambodian Hut, on the Mekong.

and flows s.e. through Burmah, Siam, Cambodia, and French Cochin-China to its mouth in the China Sea.

**Mela,** POMPONIUS, 1st cent. Earliest Roman writer on geography. His *De Chorographia* was tr. 1585.

**Melaconite.** CuO. Black earthy cupric oxide, occurring as a product of alteration of other copper ores.

**Melamet,** DAVID, b. 1861. German-American conductor and composer. *Columbus*, 1892.

**Melampus.** In Greek legend, soothsayer who understood the language of birds.

**Melampyrin.** See DULCITE.

**Melanchthon,** PHILIP (SCHWARZERD), 1497–1560. German reformer and humanist, prof. at Wittenberg 1518; Luther's

Philip Melanchthon.

right-hand man. As author of the Augsburg Confession 1530, he is the founder of Lutheran theology.

**Melanesians.** Natives of the islands between New Guinea and the Fiji Islands. They are negritos, closely allied to the PAPUANS (q.v.), but in the eastern islands the stock is largely Polynesian, though the language is Papuan. The archipelagoes included are the Solomon Is., Admiralty Is., New Britain, New Hebrides, New Caledonia. Great diversity exists among the different islanders. The Admiralty islanders are remarkable for having feet like those of the apes, the great toe being much shorter than the other toes, which are prehensile. Spears and clubs, rather than bows, are the usual weapons; they wear an ornament piercing the septum of the nose, take great pains in dressing their hair fantastically, and wear little or no clothing.

**Melanochroi.** Dark-skinned Iranians, or Caucasians, as the Hindoo, Semitic and Hamitic branches. See MAN.

**Melanophyceæ.** Dark-green, brown or olive green *Algæ;* known as *Melanosporeæ*, *Phæophyceæ*, and *Phæosporeæ*.

**Melanterite.** $FeSO_4.7H_2O$. Natural green vitriol, or copperas, resulting from the alteration of pyrite or marcasite.

**Melanthus.** In Mythology, King of Athens and father of Codrus.

**Melastomaceæ.** Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Dicotyledons*, comprising ab. 150 genera and 3,000 species, growing in great abundance in tropical American regions, a few extending into the temperate zones.

**Melbourne.** Seaport and capital of Victoria, Australia, the most populous and the largest commercial city of that

Post Office, Melbourne.

island, on Port Phillips Bay; founded 1835–37, incorporated 1842. Its trade is very large, but since 1889 it has been much troubled by the labor question. Pop., 1891, 491,378.

**Melbourne,** WILLIAM LAMB, VISCOUNT, 1779–1848. M.P. 1805; transferred to House of Lords 1828; Home Sec. 1830; Prime Minister 1834–41.—His wife, LADY CAROLINE, 1785–1828, pub. *Glenarvon*, 1816, and other novels.

**Melchites.** 1. Syrians connected with R. C. Ch. since ab. 1650, but retaining Greek rites: they number ab. 35,000. 2. In 4th century and later, Egyptian Christians not monophysites.

**Melchizedek.** King of Salem, in Palestine, and priest; mentioned Genesis xiv. as revered by Abraham; in Psalm cx. and Hebrews vii. a type of Christ.

**Meldrum,** DAVID STORRAR, b. 1866. Scottish novelist. *Story of Margrédel*, 1894.

**Meleager.** Leader of the heroes who slew the Calydonian boar. When he was 7 days old, the fates declared he would die when a brand then burning on the hearth should be consumed. His mother, Althæa, extinguished it and hid it in a chest, but years after, to avenge the death of her brothers, threw it into the fire, causing his death.

**Meleager,** d. 94 B.C. Syrian-Greek poet, follower of Menippus.

**Meleagris.** 1. Genus of Turkeys; gallinaceous birds, natives of N. America (*M. gallopavo*), Mexico, and Central America (*M. ocellata*); in all 3 species. 2. Species of Guinea-fowl originally from Africa (*M. numida*).

**Mêlée.** The confusion that follows a successful attack in battle, the thick of the fight.

**Melegnano,** or MARIGNANO. Town of n. Italy, 12 m. s.e. of Milan; scene of the "Battle of the Giants," in which Francis I. of France defeated the Duke of Milan and the Swiss, Sept.

Battle of Melegnano. Bass-relief on tomb of Francis I. at St. Denis.

13–14, 1515. Here too the Austrians intrenched themselves after the battle of Magenta, and were dislodged by the Allies, June 8, 1859. Pop., 1891, 5,438.

**Melendez,** VALDEZ JUAN, 1754–1817. Spanish poet, prof. Salamanca 1781; Judge 1789; in exile 1811. *Batilo*, 1780.

**Meletius.** 1. Bp. of Lycopolis in Egypt, condemned for schism 325. 2. Bp. of Antioch 361, d. 381. His expulsion caused a schism which lasted till 415.

**Melgar,** MARIANO, 1791–1815. Peruvian lyric poet and martyr of liberty.

**Melgarejo,** MARIANO, 1818–1872. Pres. or dictator of Bolivia 1864–71.

**Meli,** GIOVANNI, 1740–1815. Sicilian poet.

**Meliaceæ.** Natural family of flowering plants of the class *Angiospermæ* and sub-class *Dicotyledons*, comprising 37 genera and ab. 550 species, distributed generally throughout the warmer regions of the whole earth.

**Melicertes.** In Greek legend, child changed with his mother into a sea-god.

**Melic Grass.** Grasses of the genus *Melica*, of wide geographical distribution.

**Melikoff,** LORIS, COUNT, 1826–1888. Russian general, of Armenian descent; colonel of cavalry in Crimean war; Adjutant-gen. to Grandduke Michael in army of Caucasus 1877; Gov. of Astrakhan and Kharkov; Minister of Interior 1880–81.

**Melilot.** Herbs of the genus *Melilotus*, of the natural family *Leguminosæ*, mostly natives of the Old World, widely distributed as weeds throughout America; known as Sweet Clover. There are numerous species; among them the yellow, *M. officinalis*, and white, *M. alba*. Both are somewhat troublesome weeds in the n. U. S., especially in low, moist, and rich soils. White melilot is sometimes grown as a forage plant, and somewhat resembles lespedeza or Japan clover.

M. altissimas.

**Melissic Alcohol.** See MYRICYL ALCOHOL.

**Melita.** Ancient name of Malta, where St. Paul was shipwrecked on his voyage to Rome.

**Melito.** Bp. of Sardis ab. 170; author of an Apology.

**Melitose.** See RAFFINOSE.

**Melliferous.** In Botany, honey-bearing organs.

**Mellite.** $Al_2C_{12}O_{12}.18H_2O$. Hydrous aluminium mellate, found sometimes associated with brown coal.

**Mellitic Acid.** $C_6(COOH)_6$. Fine, silky needles, soluble in water. It can be obtained by oxidizing charcoal (carbon) in an alkaline solution of potassium permanganate. It is not affected by acid, or the halogens. Heated with lime, it yields benzene. See MELLITE.

**Melo,** or **Mello,** FRANCISCO MANOEL DE, 1611–1665. Portuguese soldier, historian, and poet; voluminous writer.

**Melodeon.** Musical instrument allied to the harmonium; once popular in America, but now superseded.

**Melodrama.** Play or opera of markedly sensational or sentimental character, appealing to the emotions too openly or by cheap methods; first applied to the opera by Rinuccini.

**Melody.** Succession of musical tones so ordered in respect of intervals and rhythm as to be satisfying to the ear; the most essential element in modern music where it stands for the idea which harmony and instrumentation illustrate and exploit. Synonyms in popular phrase are tune and air, but strictly speaking these terms indicate a more perfect organism, a more complete combination of parts (motive, phrase, period, and section) than is necessarily associated with the conception melody, which may be applied to a succession of tones in a subordinate voice and one that only imperfectly exemplifies the principle of form.

**Melon,** MUSK. *Cucumis melo.* Vine of the Cucumber family, bearing large luscious fruit, widely cultivated in warm and temperate regions.

**Melon,** WATER. *Citrullus vulgaris.* Vine of the Cucumber family, widely cultivated.

**Melos,** or MILO. Greek island, in which was found the famous statue, *Venus de Milo*, now in the Louvre.

**Melpomene.** Muse of tragedy.

**Melrose.** Scottish village, 35 m. s. of Edinburgh, famous for its ruined abbey, the church of which, when entire, was

Melrose Abbey.

the finest in Scotland; built 1136 and later. It is a great tourists' center; nearby is a large hydropathic establishment.

**Melting Point.** See FUSION.

**Melville,** ANDREW, 1545–1622. Scottish reformer and poet, dreaded by James VI. as a stanch Presbyterian; principal of Glasgow Univ. 1574–80, rector of St. Andrews 1590–97, imprisoned in London 1607–11, Prof. Sedan from 1611. *Carmen Mosis*, 1574.

**Melville,** GEORGE JOHN WHYTE, 1821–1878. Scottish novelist and poet. *Digby Grand*, 1853; *Katerfelto*, 1875.

**Melville,** GEORGE WALLACE, U.S.N., b. 1841. Survivor of the *Jeannette* expedition to the Arctic regions, 1879–81, in which he endeavored to save the other crews; chief engineer of the navy 1887–95. *In the Lena Delta*, 1885.

**Melville,** HERMAN, 1819–1891. American novelist and poet. His *Typee*, 1846, and *Omoo*, 1847, describe life in the South Sea Islands. *Moby Dick*, 1851.

**Melville,** or **Melvil,** SIR JAMES, 1535–1607. Scottish diplomatist, whose *Memoirs* were pub. 1683.

**Melville Island.** Of N. America; in the Arctic Ocean; discovered by Parry 1819.

**Members.** Parts separated by the sign of equality or inequality in an algebraic statement.

**Membrane Bones.** Skull bones that originate by ossification in the cutis or dermis of the skin; opposed to those preformed in cartilage. They are also the exoskeletal, as opposed to the endoskeletal, elements of the cranium.

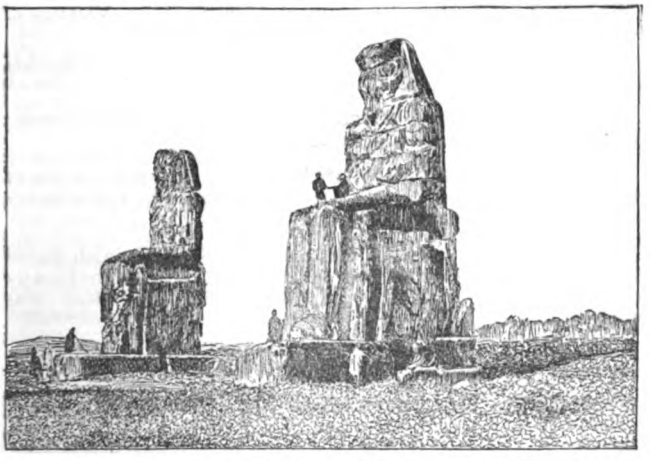
**Membranogenic.** In Botany, solutions which give rise to a membranous precipitate along their plane of contact.

**Membré,** ZENOBÉ, 1645–1689. Flemish Franciscan, missionary in Canada 1675–81 and 1683. He shared La Salle's explorations, and described them in *Nouvelle France*, 1691.

**Memel,** or NIEMEN. River of western Russia, flowing into the Baltic. Length 493 m.; drainage area 36,355 sq. m.

**Memling,** HANS, ab.1450–ab.1495. Flemish painter, most distinguished of his time. He has a *Last Judgment* in Dantzig, paintings on the Chest of St. Ursula, and other works in Bruges; one picture in Munich, and another in Turin. Authentic Memlings are rare.

**Memnon.** Son of Tithonus and Eos (Aurora), who led the Ethiopians to the aid of Priam in the Trojan war. His name was associated by later Greeks with two seated colossal statues of Amenophis III. at Thebes, dating ab. 1500 B.C. They flanked the approach to a temple now wholly destroyed; they are about



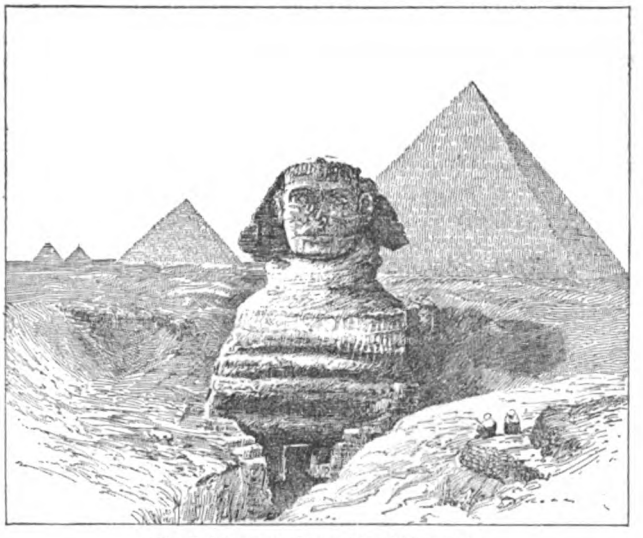
Colossal Statues of Memnon.

50 ft. high in the solid block, on pedestals 10 ft. high. One of these was partly overthrown by an earthquake 27 B.C. After this time singing noises, emitted from the statue at sunrise, were heard and mentioned by many travelers. The noises ceased when the statue was repaired by Septimius Severus. It is not known whether fraud or natural causes produced these sounds.

**Memorial Day.** See DECORATION DAY.

**Memory.** Power of retaining past experiences and reproducing them in consciousness; fundamental mental phenomenon involving retention, recollection, and recognition; *i.e.*, I retain the traces of a past experience, recall or represent it in present consciousness, and recognize it as having occurred in past time in my experience. The clearness of memory appears to depend largely upon the intensity of attention to the event to be remembered. If the attention be slight, the memory is faulty. Experiences in consciousness are not isolated, but are associated with other ideas and occurrences: when one idea is present in the mind, it tends to call up others according to the laws of ASSOCIATION (q.v.). The more persistent and numerous the associations of any given idea, the more quickly and surely can it be recalled. The physiological basis of memory seems to lie in the ability of the central nervous system to retain traces of every stimulation and to reproduce the accompanying state upon the reappearance of the stimulus or one associated with it. These associative stimuli are assumed to be conducted along the so-called association fibers of the brain, and the oftener such an association is completed, the more readily can it be carried out again. Memory becomes then physiologically simply an expression of the universal law of habit.

**Memphis.** Capital of Egypt for over 1,000 years; founded by Menes, first historical king; on w. arm of the Nile. It was 17 m. in circumference, contained numerous temples; was second only to Thebes; and was mentioned in Scripture as Moph



The Sphinx and Pyramids at Memphis.

and Noph. In Strabo's time it was inferior only to Alexandria, and was still of importance at the time of the Arabic conquest. Cairo was built largely from its ruins. In recent years vast remains have been excavated.

**Memphis.** City of Shelby co., Tenn., on a bluff on the Mississippi. It is a river port of much importance, which was yet greater before the advent of railroads. It was founded 1820, chartered as a city 1831 and 1891, surrendered to Union forces June 6, 1862, and raided by Forrest 1864. It suffered from yellow fever 1873 and 1878–79. Pop., 1890, 64,495.

**Memphremagog,** LAKE. In Canada and Vt.; 35 m. long; noted for scenery.

**Mena,** JUAN DE, 1411–1456. Spanish poet, imitator of Dante.

**Menabrea,** LUIGI FEDERIGO, MARQUIS DE VALDORA, 1809–1896. Italian soldier and diplomatist; Senator and Lieut.-gen. 1860, Count 1861; Premier 1867–69; Minister to Austria 1870, England 1876, and France 1882–92; Marquis 1875. *La Série de Lagrange*, 1844–47.

**Menaccanite.** See ILMENITE.

**Menage,** GILLES, 1613–1692. French lexicographer, founder of the Mercuriales, opposed to the Academy. *Dict. Etymologique*, 1650; *Origini della Lingua Italiana*, 1669.

**Menai Strait.** Between Wales and Anglesey; 14 m. long, 200 yards to 2 m. wide; noted for scenery, difficult navigation, and bridges built 1825 (suspension) and 1850.

**Menam.** River of w. Siam, flowing s. into Gulf of Siam. Length ab. 750 m.

**Menander,** 342–291 B.C. Principal writer of the New Comedy at Athens, which employed the society plot instead of the political satire common before. He was much admired posthumously: his works furnished the material for most of the Latin plays of Terence. They exist only in fragments.

**Menant,** JOACHIM, b. 1820. French student of cuneiform inscriptions and writer on Assyriology.

**Mencius,** or MENG-TSE, ab. 372–289 B.C. Chinese moral and political philosopher. The record of his teachings and conversation forms the fourth of the Chinese canonical books. He came of a noble family of the same state with Confucius, and is second only to him in reputation and authority.

**Mendeleeff,** DMITRI IVANOVITCH, b. 1834. Russian chemist; prof. St. Petersburg 1866. He has contributed largely to chemical philosophy and physical chemistry. *Principles of Chemistry*, 2 vols., tr. 1891.

**Mendelssohn,** MOSES, 1729–1786. German Jewish philosopher, grandfather of the composer, and original of Lessing's *Nathan the Wise*, 1778; author of *Metaphysics*, 1763; *Phædon*, 1767; *Jerusalem*, 1783; *Morgenstunden*, 1785.

**Mendelssohn-Bartholdy,** (JAKOB LUDWIG) FELIX, 1809–1847. German composer of Jewish birth but Christian education. He came of a family prominent in letters and society; his father, Abraham, was a wealthy banker. His first teacher was his mother, but his precocity was great and as a lad he studied pianoforte with Berger and composition with Zelter. He first played in public 1818, and began composition 1820. At 17 he wrote the overture to Shakespeare's *Midsummer Night's Dream*, still one of his most finished and popular pieces. His only opera, *Die Hochzeit des Camacho* (he left an unfinished fragment of another, *Lorelei*) was produced 1827. His great popularity was founded in England, whither he first went 1829. He conducted 1829 in Berlin the first performance of the *Passion Music According to St. Matthew*, since Bach's death, 1750.

Felix Mendelssohn-Bartholdy.

Bach's influence is visible in his motets, and especially his oratorios, *St. Paul*, 1836, and *Elijah*, written for the Birmingham festival, 1846. He traveled in Italy in 1830, became director of the Lower Rhenish festivals 1833, was Municipal Director of Music in Düsseldorf 1833–35, became conductor of the Gewandhaus concerts in Leipzig 1835, and founded the Leipzig conservatory 1843. He produced his music to the *Antigone* of Sophocles 1841. His admiration for Weber as a lad helped to turn his thoughts toward the romantic school of composition, to which he contributed strong props with his *Midsummer Night's Dream*, five symphonies, a violin concerto (still the most generally admired work of its kind), two pf. concertos (G minor and D minor), and especially his *Songs Without Words*.

**Mendenhall,** THOMAS CORWIN, LL.D., b. 1841. Prof. of Physics at Ohio State Univ. 1873–78, 1881–84, and at Tokio, Japan, 1878–81; in U. S. Signal Service 1884–86; Supt. U. S. Coast Survey 1889–94; Pres. Polytechnic Institute at Terre Haute, Ind., 1886–89, and of Worcester, Mass., Polytechnic Institute since 1894. *A Century of Electricity*, 1887.

**Mendes,** CATULLE, b. 1841. French novelist, poet, and dramatist. *Captain Fracasse*, 1872; *Fiamette*, 1889.

**Mendes Leal da Silva,** JOSÉ, 1820–1886. Portuguese poet, dramatist, and novelist; Ambassador to France 1874–83, and to Spain 1883–86.

**Mendez-Pinto,** FERNAO, ab. 1510–1583. Portuguese traveler in Asia and n. e. Africa, founder of a Jesuit school in Japan. *Peregrinaçao*, pub. 1614.

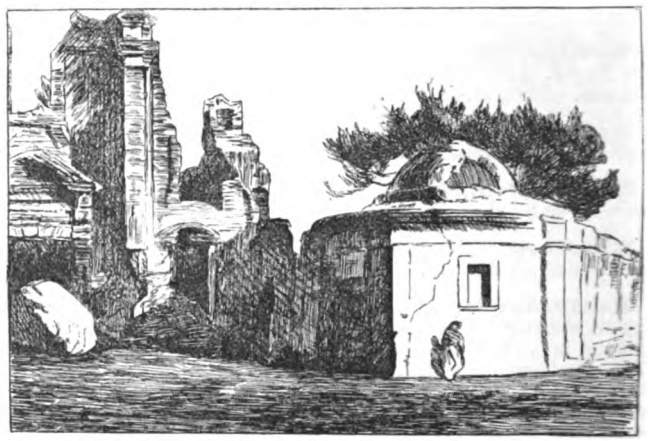
**Mendiburn,** MANUEL DE, 1805–1885. Peruvian soldier and statesman. *Dict. Hist. of Peru*, 8 vols., 1874–86.

**Mendicant Orders.** Dominicans, founded 1215, and Franciscans, founded 1209, as originally living on charity; also the less influential Carmelites, Augustinians, and Servites.

**Mendo,** ANDRÉS, 1608–1685. Spanish Jesuit, writer on academic law, 1655, and military orders, 1657.

**Mendocino,** CAPE. On n. coast of Cal.

**Mendoza.** Town in Argentine Republic 620 m. n.w. of Buenos Ayres, at an altitude of 2,559 ft. Its chief buildings



Ruins at Mendoza, destroyed by Earthquake March 20, 1861.

were destroyed by an earthquake 1861. Mean annual rainfall is ab. 8 in. Pop. 18,000.

**Mendoza,** ANTONIO DE, 1485–1552. Viceroy of Mexico 1535–49, and of Peru 1551.

**Mendoza,** DIEGO HURTADO DE, 1503–1575. Spanish poet, historian, and romancer; Ambassador to Venice 1538 and to Rome 1547–54. His novel, *Lazarillo de Tormes*, 1553, tr. 1586, was long popular, and was continued by other hands: his *War of Granada* was pub. 1610–1776.—His great-grandfather, INIGO LOPEZ, made Marquis of Santillana 1445, was a poet and literary historian. Another of this family, ANTONIO HURTADO, ab. 1600–1644, was a dramatist and lyric poet.

**Mendoza,** PEDRO DE, ab. 1487–1537. Gov. of La Plata 1535; founder of Buenos Ayres.

**Mendoza y Luna,** JUAN DE, ab. 1560–ab. 1625. Viceroy of Mexico 1603, and of Peru 1607–15.

**Menedemus,** 4th cent. B.C. Greek philosopher of Eretria in Bœotia, pupil of Plato.

**Menelaus.** Son of Atreus and brother of Agamemnon; King of Lacedæmon and husband of Helen.

**Menelek,** d. 1895. King of Abyssinia. He made a treaty with Italy 1885, and with his death, by lightning, the country became a dependency of the latter.

**Menendez de Avilés,** PEDRO, 1519–1574. Spanish naval commander. In 1565 he sailed to Florida and murdered many French colonists. On this expedition St. Augustine was founded.

**Menendez y Pelayo,** MARCELINO, b. 1857. Spanish poet, critic, and historian.

**Meneptah.** Egyptian king of the 19th dynasty; son of Rameses II.

**Menes,** or MENA. First king of the first dynasty of Egypt; founder of Memphis and its great temple; famed as legislator and warrior.

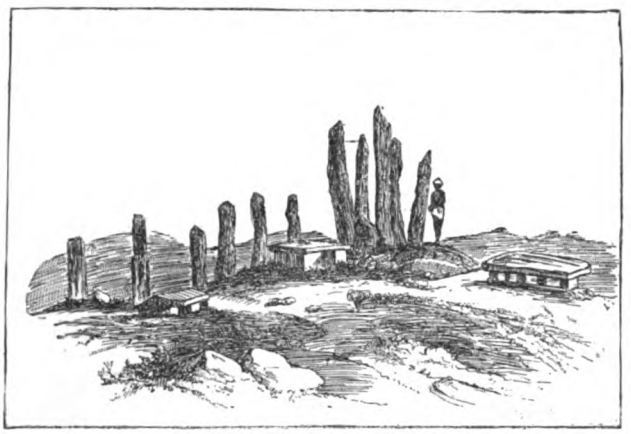
**Menger,** KARL, b. 1840. Austrian political economist, Prof. Vienna 1873. *Grundsätze der Volkwirthschaftslehre*, 1871; *Methode der Sozialwissenschaften*, 1883; *Zur Kritik der Politischen Oekonomie*, 1887.

**Mengs,** ANTON RAPHAEL, 1728–1779. German painter, resident at Rome, where he left frescoes in the Albani Villa. He had great influence on the art criticisms of Winckelmann.

**Meng-tse.** See MENCIUS.

**Menhaden.** See ISOSPONDYLI and CLUPEIDÆ.

**Menhir.** Upright rough-hewn stone, found either singly or in rows, often of great size and height; form of prehistoric



Menhirs and Tables, Khassia Hills, India.

monument especially common in Brittany, but widespread in range elsewhere. No written record or traditions are extant to explain their meaning.

**Meninges** (CEREBRAL AND SPINAL). The membranes which invest the brain and spinal cord. They are the DURA MATER, ARACHNOID MEMBRANE, and PIA MATER (q.v.).

**Meningitis.** Inflammation of the membranes of the brain and spinal cord; known as leptomeningitis when it involves the arachnoid and pia mater, and pachimeningitis, the dura mater. There are acute and chronic forms. It occurs most frequently in childhood. Caused by injuries to the head, extension of local inflammation from the middle ear, etc., infected emboli; it also occurs as a complication of specific diseases, like pneumonia, scarlet fever, erysipelas, etc. Cerebro-spinal meningitis, spotted fever, occurs sporadically and in epidemics, and is caused by a specific germ. The lesion is essentially the same as in simple meningitis. Tubercular meningitis is caused by the tubercle bacillus. Prognosis in all forms is extremely uncertain.

**Menippus,** 3d cent. B.C. Greek cynic and satirist, imitated by Varro. None of his works survive. The *Satire Menippée*, a French political collection, appeared 1594.

**Meniscus.** See LENS.

**Menispermaceæ.** Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Dicotyledons*, comprising ab. 56 genera and 250 species, mostly vines, widely distributed throughout the tropical regions of the whole world, a few extending into the temperate zones; called the Moonseed family.

**Menken,** ADAH ISAACS (FUERTES), 1835–1868. American actress and poet, three times divorced, and mistress of Alexander Dumas, senior. *Infelicia*, 1867.

**Mennonites.** German and Dutch Baptists, originating with Simon Menno, 1492–1559. They object, like Quakers, to war and oaths. Persecuted in Switzerland and elsewhere, some of them came to Pa. 1682. Many settled in Russia 1783, but emigrated 1871 and later. The U. S. census of 1890 gave their number (previously supposed much larger) as 41,541, divided among 12 organizations.

**Menobranchus.** See PERENNIBRANCHIATA.

**Menopoma.** See DEROTREMA.

**Mensuration.** Branch of applied geometry which gives the rules for finding the lengths of lines, the areas of surfaces, and the volumes of solids. See TRIGONOMETRY.

**Mental Desires.** Those whose objects present themselves to the mind as abstractions instead of material objects; *e.g.*, the desire of safety, of possessions, of society, of superiority, and of knowledge.

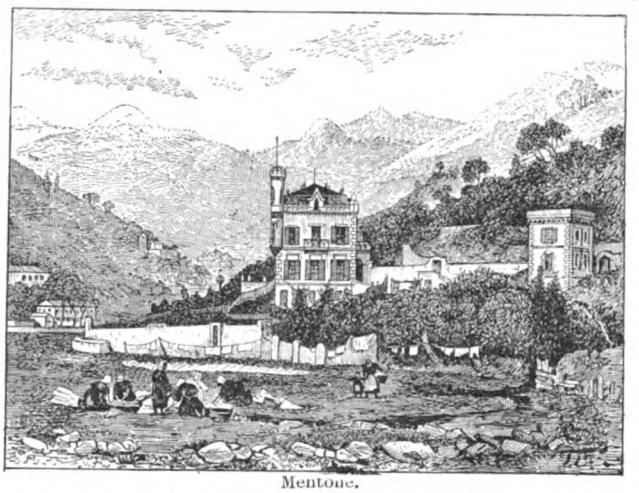
**Mental Philosophy.** See PSYCHOLOGY.

**Mentana.** Village 12 m. n.e. of Rome, where 5,000 papal and French troops defeated Garibaldi and his 3,500 volunteers, Nov. 3, 1867.

**Mentchikoff,** ALEXANDER, 1672–1730. Russian adventurer, made Prince 1707, Field-marshal 1709; victor in several battles; disgraced 1713, banished 1727.—His descendant, ALEXANDER, 1787–1869, held command in the Crimean war.

**Menthol.** $C_{10}H_{19}.OH$. Mpt. 42° C, bpt. 213° C. Mentha camphor; camphor-like substance, main constituent of oil of peppermint; obtained by chilling the oil. It is an alcohol, and much used as a local anæsthetic.

**Mentone.** Town of s.e. France, on the Mediterranean, 14 m. n.e. of Nice; noted as a winter resort. In the 14th century



Mentone.

it was purchased by the lords of Monaco, who ruled it, except during the period of the revolution, when France seized it. Pop., 1891, 8,319.

**Mentor.** Friend of Ulysses and preceptor of Telemachus.

**Mentum.** Chin of insects; that part of the second maxilla which bears the ligula and joins on to the submentum and gula. —In Botany, projecting appendage at base of the column in the flowers of some orchids.

**Mentz.** See MAINS.

**Menu.** Reputed author of the most renowned law-book of the ancient Hindus, and an ancient work on Vedic rites.

**Menzaleh,** LAKE. In n.e. Egypt. Its area, ab. 500 sq. m., was anciently cultivated land, with several cities.

**Menzel,** ADOLPH, b. 1815. German historical and genre painter, eminent as an illustrator.

**Menzel,** WOLFGANG, 1798–1873. German romancer, historian, and controversialist. *Rubezahl*, 1829; *Hist. German Literature*, 1827, tr. 1840.

**Menzini,** BENEDETTO, 1646–1704. Italian lyric and satiric poet.

**Mephistopheles.** Presentation of Satan, famous through Goethe's *Faust*.

**Mephitis.** See MUSTELIDÆ.

**Mercadante,** GIUSEPPE SAVERIO RAFAELE, 1797–1870. Italian opera composer, director of the Royal School of Music in Naples from 1840. He became blind 1862, but continued his labors. His operas had no enduring popularity outside of Italy; the best known is *Il Giuramento*, 1837.

**Mercantile Agencies.** Institutions established for the purpose of obtaining and giving out the financial standing and character of business firms. A subscriber to the agency receives for a small consideration the standing of any party he wishes to have. The agency also publishes a book containing the names and standing of those reported. The system used in the U. S. was started in 1840.

**Mercantile Law.** Body of rules originating the customs of merchants. It includes Partnership, Negotiable Paper, Shipping, and other heads.

**Mercantile System** OF POLITICAL ECONOMY. Body of economic doctrine which prevailed in Europe ab. 1600–1730. It laid excessive stress on the importance of money and a deliberate regulation of trade by government, following in this the political ideals and in a certain sense the requirements of the time.

**Mercaptans.** Organic sulphydrates. They form insoluble precipitates with mercury salts, whence the name, and are liquids of horrible odor. ETHYL MERCAPTAN, $C_2H_5SH$ (q.v.).

**Mercati,** MICHELE, 1541–1593. Medical writer at Rome.

**Mercator** (KREMER), GERARD, 1512–1594. Flemish geographer.

**Mercator,** MARIUS. Controversialist, at Rome 418, at Constantinople from 428; active against the Pelagians.

**Mercator,** NICHOLAS, ab. 1620–1687. German astronomer and scientist, in Paris from ab. 1670. *Cosmographia*, 1651; *Institutiones Astronomicæ*, 1676.

**Mercator's Projection** (GERARD). Method of constructing on a map the lines representing the meridians and parallels of latitude so that each are represented by parallel lines, while the distance apart of the latter varies with the secant of the latitude. It is well adapted for regions near the equator, but unsuitable for those near the poles, on account of the distortion produced.

**Mercenaries.** Soldiers who take service in foreign armies for pay and emoluments, not actuated by principles of honor or patriotism.

**Mercer,** HUGH, ab.1720–1777. Scottish surgeon, in America from 1747; Col. 3d Va.; Brig.-gen. 1776; killed at Trenton. N. J.

**Mercersburg Theology.** In German Reformed Ch., through its seminary at Mercersburg, Pa., 1836–66. Its salient points were Christological, sacramental, ecclesiological, and liturgical.

**Merchant Gilds.** See GUILDS.

**Merchant Taylors' School.** Founded in London 1561. Its present house was built 1873–74. It has ab. 500 pupils.

**Mercia.** Kingdom of mid England; founded 584; under Ethelbald, 716–755, and his successors, it embraced Britain s. of the Humber, but became subject to Wessex 825.

**Mercié,** ANTOINE, b. 1845. French sculptor. His *Quand Même*, at Belfort, was shown in cast at the World's Columbian Exposition, Chicago. The monument to Thiers, in the cemetery Pere la Chaise at Paris, is his work.

**Mercier,** HONORÉ, LL.D., 1840–1894. Leader of Canadian liberals; Premier of Quebec 1887–91.

**Mercier,** LOUIS AUGUSTE, b. 1811. French medical writer. *Maladies des organes urinaires*, 1841–56.

**Mercier,** LOUIS CHARLES ANTOINE, 1744–1812. French military engineer, much in America; explorer of the northwest; writer on La. and the Mississippi.

**Merck,** JOHANN HEINRICH, 1741–1791. German journalist and critic. *Schreften*, 1840.

**Mercur,** ULYSSES, 1818–1887. Pres. judge 13th Pa. district 1861–65; M.C. 1865–72; Judge Pa. Supreme Court 1872, Chief-justice 1883.—His son, JAMES, U.S.A., b. 1842, has done service as a military engineer, especially at Hell Gate, N. Y., and has been prof. at West Point since 1884. *Art of War*, 1888; *Mines*, 1892.

**Mercuric Arsenate.** $Hg_3(AsO_4)_2$. Yellow precipitate, soluble in hydrochloric acid; made by precipitating mercuric nitrate with arsenic acid.

**Mercuric Bromide.** $HgBr_2$. It crystallizes from water solution in delicate, silvery leaflets, from alcohol in white needles, and is made by the action of bromine on mercury at ordinary temperature.

**Mercuric Chloramide.** $HgNH_2Cl$. White precipitate, made by treating corrosive sublimate, $HgCl_2$, with ammonium hydroxide.

**Mercuric Chlorate.** $Hg(ClO_3)_2H_2O$. Small needles or quadratic prisms, obtained by dissolving mercuric oxide in a warm aqueous solution of chloric acid.

**Mercuric Chloride** (CORROSIVE SUBLIMATE, q.v.). $HgCl_2$. White, crystalline, transparent substance, very poisonous, soluble in water, alcohol, and ether; made by heating mercuric sulphate and sodium chloride; used in medicine as a disinfectant; used to prevent wood from decaying. See KYANIZING.

**Mercuric Cyanide.** $Hg(CN)_2$. Colorless quadratic columns, moderately soluble in water; made by shaking mercuric oxide with an aqueous solution of hydrocyanic acid.

**Mercuric Fluoride.** $HgF_2.2H_2O$. White, crystalline solid, obtained on adding dry mercuric oxide to concentrated hydrofluoric acid.

**Mercuric Iodide.** $HgI_2$. Bright-red substance, made by adding potassium iodide to mercuric chloride. At first the precipitate is yellow, but it immediately changes to red; at 126° it turns yellow.

**Mercuric Nitrate.** $Hg(NO_3)_2$. Made by dissolving mercury in an excess of hot nitric acid; difficult to obtain pure, since it forms basic salts with great ease.

**Mercuric Nitride.** $Hg_2N_2$. Yellow or brown powder, which explodes on being struck or exposed to certain light rays; formed by passing ammonia over mercuric oxide heated 40°–50° C.

**Mercuric Oxide.** HgO. It occurs in two forms, yellow and red. If mercury be heated for some time, the red oxide is formed; if caustic soda be added to a mercuric salt, the yellow oxide is precipitated. At red heat its constituents are separated. It was by working on this substance that Priestley discovered oxygen. The sun-glass which he used is now in possession of Dickinson College.

**Mercuric Phosphate.** $Hg_3(PO_4)_2$. Heavy white crystalline powder, soluble in a solution of sodium chloride; made by precipitating a solution of mercuric nitrate with sodium acid phosphate.

**Mercuric Sulphate.** $HgSO_4$. White, crystalline salt, made by treating the metal or oxide with concentrated sulphuric acid.

**Mercuric Sulphide.** HgS. Prepared by passing hydrogen sulphide into a mercuric salt solution, when a black precipitate is formed, which yields a red sulphide on distillation, vermilion; the natural variety is red. It is soluble with difficulty in ordinary acids. See CINNABAR and VERMILION.

**Mercurous Bromide.** HgBr. White needles, tasteless, odorless, partially decomposed by sunlight; made by heating mercury and hydrobromic acid up to 100° C.

**Mercurous Chloramide.** $Hg_2NHCl$. Black compound, formed by treating calcmel, HgCl, with ammonia. It is to be regarded as ammonium chloride, $NH_4Cl$, in which two atoms of hydrogen have been replaced by two atoms of mercury.

**Mercurous Chlorate.** $HgClO_3$. Beautiful, long, rhombic prisms, obtained by dissolving freshly precipitated mercurous oxide in an aqueous solution of chloric acid.

**Mercurous Chloride** (CALOMEL). HgCl. White amorphous powder, which, when sublimed, forms a radiating crystalline mass; made by subliming a mixture of mercury, mercuric sulphate, and sodium chloride. If it be exposed to the action of light for some time, it is slowly decomposed into mercury and mercuric chloride (corrosive sublimate). It is used extensively in medicine.

**Mercurous Fluoride.** HgF. Yellow crystalline powder, obtained by treating a solution of silver fluoride with freshly precipitated mercurous chloride.

**Mercurous Iodide.** HgI. Greenish-yellow powder, made by treating a mercurous salt with potassium iodide; used in medicine. It breaks down into mercury and mercuric iodide; as the latter is poisonous, great care must be exercised in handling it.

**Mercurous Nitrate.** $HgNO_3$. Crystallized compound, made by dissolving mercury in nitric acid and evaporating the solution to crystallization.

**Mercurous Oxide.** $Hg_2O$. Black powder, decomposing under the influence of light into mercury and mercuric oxide; made by treating a mercurous salt with sodium or potassium hydroxides.

**Mercurous Sulphate.** $Hg_2SO_4$. White crystalline compound, made by gently heating mercury in excess with sulphuric acid. If heated, it decomposes into mercury, oxygen, and sulphur dioxide.

**Mercurous Sulphide.** $Hg_2S$. It is formed when mercurous acetate solution is dropped into sodium or ammonium sulphide. It contains some Hg.

**Mercury.** Roman divinity of gain and commerce; greatly different from the Greek Hermes, with whom in later times he was identified.

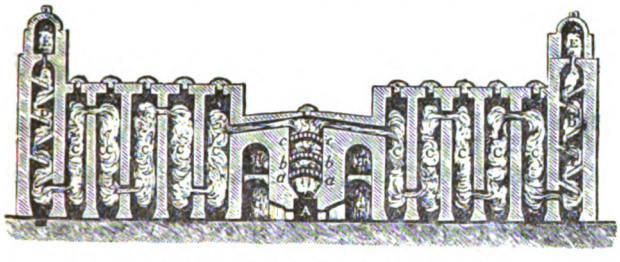
Mercury.

**Mercury.** First planet in order of distance from the sun. There is no record of its discovery, but records exist of observations of it as early as 264 B.C. Mean distance from sun, 36,000,000 m.; diameter 3,030 m.; density 12 times that of water; period of revolution about sun 87.96926 days. There is no satellite. Authorities differ as to the period about the axis; ab. 24 hours is given by some, others believe it the same as that about the sun; it is extremely difficult to determine. Being within the orbit of the earth, when viewed through a telescope, it presents phases like those of the moon. There are no visible markings on the surface, nor is there much trace of an atmosphere. Mercury is easily seen in the evening or morning twilight at its greatest elongation. The angular distance from the sun may then be as great as 28° 20′, though

usually it is less. Under favorable conditions it looks nearly as bright as Sirius.

**Mercury** (HYDRARGYRUM). Quicksilver. Hg. At.wt. 200, sp. gr. 13.59, sp. ht. .033-.035, valence I, II. Chemical element known to the ancients; only metal which is liquid at ordinary temperatures. In rare cases it occurs native, usually as cinnabar. It crystallizes in octahedra at 38.85° C., and boils at 357.25° C. It is unacted upon by cold hydrochloric and sulphuric acids, but dissolves readily in dilute nitric acid; it dissolves almost all of the metals except iron, forming amalgams. Tin amalgam is used for the production of mirrors. It forms two classes of salts, Mercurous, in which it acts as a univalent element, and Mercuric, in which it is bivalent.

**Mercury,** METALLURGY OF. The commercial supply comes from the sulphide, cinnabar. The mercury of Spain was known early in the Christian era; the Idria mine was opened ab. 1500. Since 1850 much of the world's yield has come from California, but relatively less in recent years. The total production 1894 was 3,952 metric tons (2,204.6 lbs.), Spain 1,653, California 1,056, Austria 521, Mexico 268, Italy 258, Russia 196. The present market price is $0.57 per lb. Cinnabar is easily reduced to mercury; a simple roasting in a current of air converts the sulphur into sulphurous acid gas, while the metal is freed and vaporizes, and is caught by condensation. When lime is present with the ore, a simple heating will cause it to react on the mercury sulphide, forming sulphide and sulphate of lime, and liberating the metal. The figure shows the type of furnace used at Idria, Austria. The ore is piled upon hollow arches in



Old Furnace at Idria; Longitudinal Section.

the central compartment, a, b, c, being heated by a fire beneath, and at the same time traversed by a current of hot air. The sulphur dioxide and mercury vapors pass through the lateral condensing chambers in which the mercury condenses, the sulphur gas passing out at the ends. In Almaden, Spain, a similar central furnace is used, but the vapors are passed through long rows of earthern vessels placed end to end, called aludels, in which the mercury condenses. In Cal. continuous furnaces are mostly used, resembling a lime-kiln or cupola in shape, the residue or gangue being continuously removed beneath, while fresh ore and fuel are charged above. The vapors pass out by a flue above, and are condensed in water-cooled condensers. Very fine ore cannot be treated in these furnaces, and for working them a shelf furnace has been devised, which consists of a vertical shaft having inclined shelves placed on alternate sides, down which the ore slides, while a current of hot air passes up through the shaft and roasts the ore as it falls. The perfect condensation of the mercury vapors is not easy, and many special forms of condensers, of glass, iron, cement, water-cooled, air-cooled, etc., have been devised. It is a poor conductor of electricity. Its principal uses are for amalgamating gold and silver in extracting them from their ores, in an amalgam of tin for mirrors, in vermilion, in apparatus for electrolyzing salt solutions in the production of cautic alkali, and in various scientific instruments, as thermometers and barometers.

**Mercury,** THREE SEEDED. Herbs of the genus *Acalypha*, natural family *Euphorbiaceæ*, abundant in warm and tropical America.

**Mercy.** Form of sympathy which prompts us especially to abstain from adding to the pain felt by another.

**Mercy,** SISTERS OF. R. C. order founded in Dublin 1834 for charitable work; approved by the Pope 1840, and introduced in the U. S. 1843.

**Mercy Seat.** In Israel, lid of the Ark of the Covenant, on which the high-priest sprinkled the sacrificial blood on the Day of Atonement.

**Meredith,** GEORGE, b. 1828. English novelist, by some esteemed the ablest living; master of an elaborate and intricate style, which has hitherto made his audience select rather than large. His best known books are probably *Richard Feverel*, 1859, *The Egoist*, 1879, and *Diana of the Crossways*, 1885. *Lord Ormont and his Aminta*, 1894. He has pub. poems, 1851–87.

**Meredith,** MRS. LOUISA ANNE (TWAMLEY), b. 1812. Anglo-Tasmanian author.

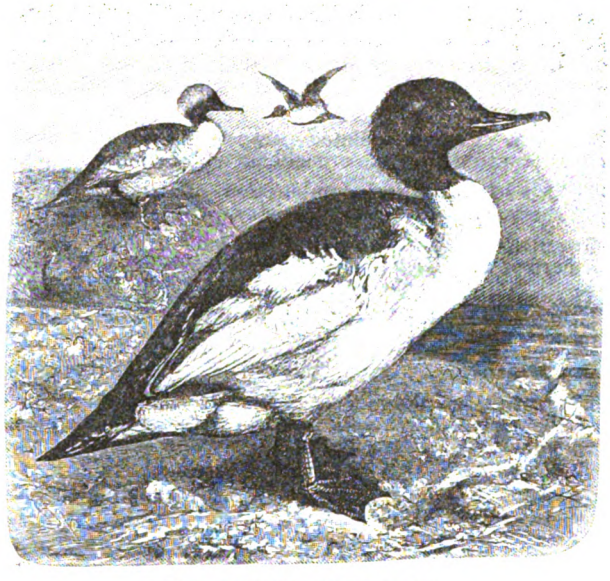
**Meredith,** OWEN. See LYTTON, EDWARD ROBERT.

**Meredith,** WILLIAM MORRIS, 1799–1873. Leader of Pa. bar; Sec. U. S. Treasury 1849–50; Atty.-gen. of Pa. 1861–67.

**Merelles.** Game played by two persons, each with nine men upon a board marked with a diagram, consisting of three squares or rectangles placed one within the other. It is almost universal and is of high antiquity. It receives a great variety of names, among them Nine Men's Morris and Bushel in England. In Germany it is called the Mill Game; in Syria, Edris, and in China, Sám K'í.

**Meres,** FRANCIS, ab. 1565–1647. English critic, compiler, and translator. *Tamia Palladis*, 1597; *Wit's Academy*, 1634.

**Mergansers.** Fish-eating ducks with narrow toothed bills, hooked at tip, and head with crest. There are ab. 7 species.



Mergansers (*Mergus merganser*).

The Goosander of Europe equals a small goose in size. The males are beautifully colored in the breeding season. See ANATIDÆ.

**Merger.** Absorption of a lesser estate or right in one of higher grade, on both vesting in the same person.

**Merian,** MATTHÆUS, 1593–1650. Swiss engraver at Frankfort. Several of his descendants were noted as painters.—His daughter, MARIA SIBYLLE (Mme. Graff), 1647–1717, wrote on insects of Surinam, 1705, and of Europe, 1730, and was assisted by her daughters, DOROTHEA and JOHANNA.

**Mericarp.** One of the component carpels in the fruit called a cremocarp, especially that of the Carrot family.

**Merida.** Capital of Yucatan; 95 m. n.e. of Campeachy; founded 1542. Pop. ab. 53,000.

**Meride.** Colony of alloplast cells, represented by the gastrula or an equivalent zoöid.

**Meriden.** City of New Haven co., Conn., well known for its manufactures of cutlery, of plated and other ware; incorporated 1806, chartered 1867. Pop., 1890, 21,652.

**Meridian.** Capital of Lauderdale co., Miss.; seat of two colleges. Pop., 1890, 10,624.

**Meridian,** CELESTIAL. Great circle formed by the intersection with the celestial sphere of the vertical plane at a given place which passes through the poles.

**Meridisk.** Appendages to or growths upon the receptacle or torus of flowers not referable to the floral organs.

**Mérimée,** PROSPER, 1803–1870. French writer of remarkable elegance. Academician 1844, Senator 1853. His publications include novels, historical and critical works, and poems. *Guzla*, 1827; *Colomba*, 1840; *Melanges*, 1855; *Lettres à une Inconnue*, 1875.

**Merino.** See SHEEP.

**Meriones.** Grandson of Deucalion; Cretan naval officer at Troy.

**Merismopedia.** See COCCUS BACTERIA.

**Meristem.** Formative condition of vegetable tissues, developing new cells by division of those already made.

**Merit.** Quality by which a moral agent renders himself worthy of a reward.

**Merit,** CERTIFICATE OF. Mark of honor conferred by the President on an enlisted man of the U. S. Army, for distinguished conduct in action, on recommendation of his commander. It brings $2 a month extra pay.

**Merivale,** CHARLES, D.D., LL.D., D.C.L., 1808–1893. Dean of Ely 1869; historian of *The Romans under the Empire*, 7 vols., 1850–62.—His brother, HERMAN, D.C.L., 1806–1874, Prof. Oxford 1837–42, Under Sec. for the Colonies 1848–60, and for India 1860, pub. *Colonization*, 1841.

**Meriwether,** LEE, b. 1862. American economist. *A Tramp Trip*, 1887.

**Merle d'Aubigné.** See AUBIGNÉ.

**Merlin.** 1. Welsh bard and magician, ascribed to 5th century. He figures largely in the Arthurian legends. His predictions were pub. 1529. 2. Similar personage of 6th century, in Scotland.

**Merlon.** In a crenellated parapet, higher solid piece of wall, alternating with the crenelle or embrasure.

**Mermaid.** Mythical combination of woman and fish, much celebrated in legend and poetry. See MANATEE.

**Mermaid,** FALSE. *Floerkea proserpinacoides.* Insignificant herb of the Geranium family, native of the e. U. S.

**Mermaid Weed.** Plants of the genus *Proserpinaca;* aquatic herbs of the Water Milfoil family, natives of e. N. America.

**Merobaudes,** FLAVIUS, 5th cent. Spanish Latin poet.

**Meroblastic.** Eggs that suffer partial segmentation. In these there is a passive yolk left over, which must be inclosed by epibolic invagination, when the gastrula stage of development is reached.

**Meroë.** Capital of Ethiopia ab. 900 B.C., situated on the Nile between the fifth and sixth cataracts; taken by Amenophis I., and by Cambyses 524 B.C., who named it Saba in honor of his sister. The ruins of this region date from 600 to 100 B.C.

Meroe.

**Merogenesis.** Production of metameres and the like. Eumerogenesis results in a eumeromorph, and Dysmerogenesis in a DYSMEROMORPH (q.v.).

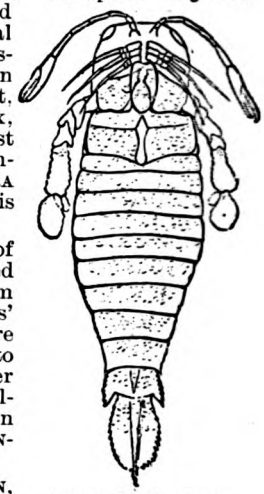
**Merom.** Enlargement of the upper Jordan, surrounded by extensive marshes; ab. 3 m. by 4.

**Meromorphism.** See MORPHON and BION.

**Meropodite.** Fourth joint in a lobster's walking limbs, counting from the body; or second of the endopodite of *Crustacea* in general.

**Merops.** See BEE EATER.

**Merostomata,** or EURYPTERIDÆ. Group of *Gigantostraca*, including Eurypterus and allied fossils. These forms have a general resemblance to Scorpions, in possessing a long, twelve-jointed abdomen without appendages, broad in front, where it joins the short cephalothorax, which bears five pairs of legs. The last pair of feet end in broad fins; the anterior pairs are chelate. XIPHOSURA (q.v.) is sometimes included in this group.



Pterygotus Anglicus.

**Merovingians.** First dynasty of Frankish kings in Gaul; descended from Merwig, ab. 418. The kingdom was divided into four parts on Clovis' death, 511, reunited under Clothaire II., and at his death, 628, divided into two, Neustria and Austrasia, the power now passed to the mayors of the palace. The dynasty ended by deposition of Chilperic IV. 752. See CARLOVINGIANS.

**Merriam,** AUGUSTUS CHAPMAN, 1843–1895. Prof. Columbia from 1868; director American school at Athens 1887–88; maker of Greek text-books.

**Merriam,** CLINTON HART, M.D., b. 1855. Naturalist, with U. S. Dept. of Agriculture from 1886. *Birds of Conn.*, 1877; *Mammals of the Adirondacks*, 1884.

**Merriam,** GEORGE, 1803–1880, and CHARLES, 1806–1887. Publishers at Springfield, Mass., especially of Webster's *Dictionary.*

**Merrick,** JAMES, 1720–1769. English poet. His psalm-versions, 1765, have been much used.

**Merrick,** PLINY, LL.D., 1794–1867. Judge Mass. Supreme Court 1853–64.

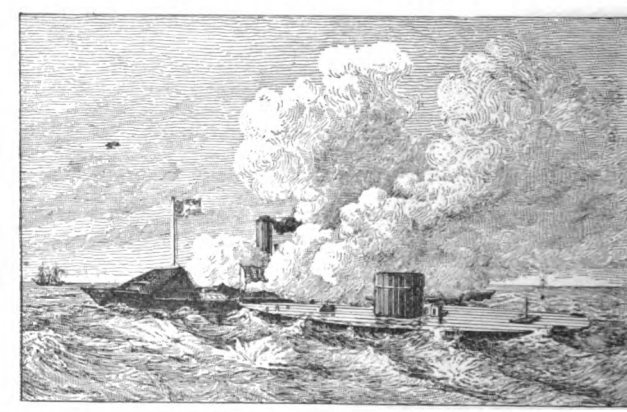
**Merrick,** SAMUEL VAUGHAN, 1801–1870. Iron-founder at Phila., prominent in scientific and public affairs.

**Merrill,** GEORGE PERKINS, b. 1854. Prof. of Geology at Columbian Univ., Washington, 1893. *Stones for Building*, 1891.

**Merrill,** LEWIS, U.S.A., 1834–1896. Commander of cavalry in the West 1861–65.

**Merrill,** SELAH, D.D., LL.D., b. 1837. Archæologist of American Palestine Exploration Society 1874–77; U. S. Consul at Jerusalem 1882–86. *East of the Jordan*, 1881; *Galilee*, 1881.

**Merrimac.** U. S. frigate, scuttled and sunk at Norfolk Navy Yard 1861; raised by Confederates; cut down nearly to the water's edge, heavily iron-plated, armed with 10 heavy guns, and renamed *Virginia.* It destroyed two U. S. ships in Hampton Roads, March 8, 1862. See MONITOR.



Monitor and Merrimac.

**Merrimac River.** In N. H. and Mass. It heads in Lake Winnepisaukee, N. H., flows s. and then e. to the Atlantic. Drainage area 4,864 sq. m., length 150 m.

**Merriman,** HENRY SETON. English novelist. *The Sowers*, 1895; *Flotsam*, 1896; *Dross*, 1897.

**Merriman,** MANSFIELD, b. 1848. Prof. of Civil Engineering in Lehigh Univ. since 1878. *Bridges*, 1876; *Least Squares*, 1877–84; *Roofs and Bridges*, 1888; *Hydraulics*, 1889; *Geodetic Surveying*, 1892; *Retaining Walls and Masonry Dams*, 1892.

**Merritt,** WESLEY, U.S.A., b. 1836. Cavalry officer 1861–65; Brig.-gen. Vols. 1863; Supt. West Point 1882–87; Brig.-gen. 1887.

**Merry,** ANN (BRUNTON), 1769–1808. English-American actress.—Her husband, ROBERT ("Della Crusca"), 1755–1798, was a playwright and poet, satirized in Gifford's *Baviad.*

**Merseburg.** Town of Prussian Saxony, on the Saale. Here the Hungarians were defeated by Henry the Fowler 934. Pop. ab. 18,000.

**Mersenne,** MARIN, 1588–1648. French author, defender of Descartes. *Harmonie Universelle*, 1836.

**Mersey.** River of w. England, flowing into the Irish Sea. Liverpool is near its mouth. Length, with its estuary, 70 m.

**Merson,** LUC OLIVIER, b. 1846. French painter.

**Merthyr Tydvil.** Town of Wales, containing extensive iron works. Pop., 1891, 58,080.

**Merton,** WALTER DE, d. 1277. Lord Chancellor of England 1261–63 and 1272–74; Bp. of Rochester 1274; founder of Merton Coll., Oxford, 1264.

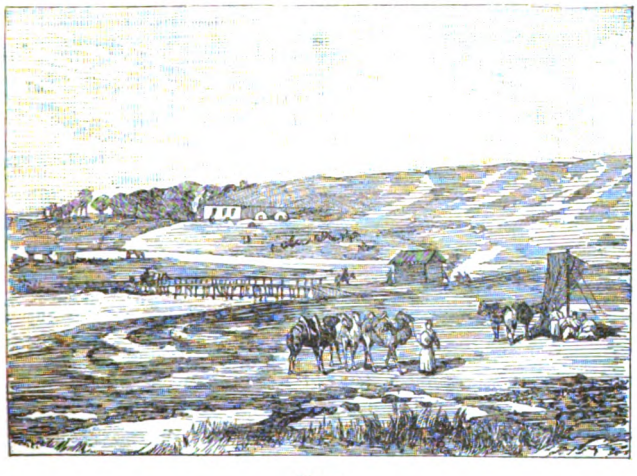
**Meru.** Mountain of Buddhist fancy, center of the universe.

**Merula,** GEORGIOS, 1424–1494. Teacher at Venice and Milan, editor of and commentator on Sundry Latin classics.

**Merula,** PAUL, 1558–1607. Prof. Leyden 1592; biographer of Erasmus; writer on classical and geographical subjects; editor of Ennius and Eutropius.

**Merulo,** CLAUDIO, 1533–1604. Italian church musician, called Correggio. His fame was chiefly acquired while organist at St. Mark in Venice, 1566–1586.

**Merv.** Oasis on the river Murghab, in Russian Central Asia, containing a city which was ravaged by the Mongols



Merv.

1221, and the inhabitants massacred. The Russians annexed M. 1884; the Transcaspian Railway now crosses it. Pop. near 200,000.

**Méry,** JOSEPH, 1798–1866. French romancer, dramatist, and poet.

**Méryon,** CHARLES, 1821–1868. French engraver, devoted chiefly to the old buildings and bridges of Paris. As an etcher of architectural subjects he ranks as one of the greatest. His marked characteristics were great delicacy, combined with great surety of line. It is said that he sketched his subjects direct from nature, holding his plate and a mirror (to reverse the objects) with one hand, while he drew with the other. *Le Stryge; Apse of Notre Dame; Pont Neuf; Rue des Etoiles.*

**Merzliakov,** ALEXSEI, 1778–1830. Russian poet and translator, prof. Univ. Moscow.

**Mesamœboids.** Cells budded off from the blastula internally, and constituting the mesenchyme. They form the entire mesoblast in Sponges.

**Mesenchyme.** That part of the mesoblast which is derived from MESAMŒBOIDS (q.v.).

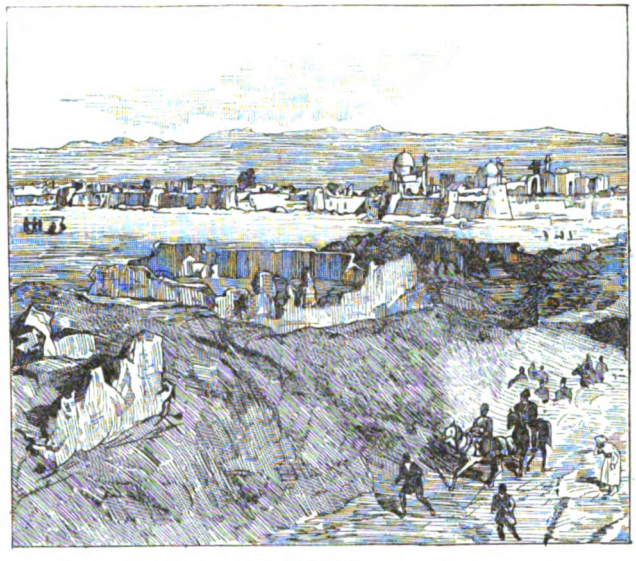
**Mesenteries of Cœlenterates.** Vertical partitions in sea-anemones and coral polyps, produced by the folding of the inner membrane of the body wall toward the center radially. Each has longitudinal muscles on one side and transverse fibers on the other surface. In *Actinia* are six pairs of principal mesenteries, since they appear first in the embryo, according to a bilateral plan, and become united to the œsophagus. There is one pair at each edge of the flattened gullet, with the transverse muscles opposed, called directive mesenteries; on each side of the gullet are two pairs with longitudinal muscles opposed. The space between the members of a pair is the intraseptal; that between the pairs, is interseptal. Mesenteries appearing later are secondary; they never reach the gullet, and always appear simultaneously in all the interseptal spaces, a pair in each. As the polyp grows, the mesenteries become successively doubled in number.

**Mesenteron.** Part of the intestine which is lined with endoderm, thus excluding the stomadæum and proctodæum.

**Mesentery.** That portion of the peritoneum which supports the small intestines; it contains the mesenteric glands, ab. 150, each as large as an almond, which increase the fibrin and corpuscles in the chyle from the lacteals.

**Mesha.** King of Moab, who, after a tributary subjection of 40 years to Israel, revolted ab. 896 B.C., and gives an account of his success in the MOABITE STONE (q.v.).

**Meshed.** City of n.e. Persia; burial-place of Iman Riza,



Meshed.

founder of the Shiite sect; visited by many pilgrims. It has a fine mosque and a large trade. Pop. ab. 60,000.

**Mesitylene.** $C_6H_3(CH_3)_3$. Symmetric trimethylbenzene; liquid hydrocarbon, boiling at ab. 163° C. It is present in coal tar, and is formed by the action of sulphuric acid upon acetone.

**Meslin.** Two crops grown together, as oats and peas; or one crop grown with another as a stolen crop, as turnips, beans, or pumpkins, planted in the intervals of the corn rows.

**Mesmer,** FRIEDRICH ANTON, or FRANZ, 1734–1815. Austrian physician, discoverer of ANIMAL MAGNETISM (q.v.) ab. 1772; successful at Paris 1778–85; then investigated by an eminent commission, whose report damaged his fame. His later life was obscure.

**Mesoarium.** Fold of the peritoneum which holds the ovaries to the body wall.

**Mesobar.** Areas of medium barometric pressure between pleiobar and meiobar; so named 1870 by Prestel.

**Mesoblast,** or MESODERM. Middle layer of cells of the blastoderm of embryos. It is formed later than the first two layers, and usually from cells that originate in the endoderm. It finally (if not so originally) cleaves or splits into two layers, an outer somatopleur and an inner splanchnopleur. The former furnishes the muscles of the body wall, the latter those of the intestine.—In Botany, nucleus of plant cells.

**Mesocardium.** Fold of peritoneum, which holds the heart and aorta to the back and breast bone; the mediastinum of human anatomy.

**Mesocarp.** Middle layer of the pericarp or seed vessel in fruits, when it consists of three layers.

**Mesocarpaceæ.** Family of minute *Algæ* of the order *Conjugatæ*, consisting of elongated filaments of cells. They inhabit stagnant fresh water.

**Mesochil.** Middle portion of the labellum in the flowers of orchids, when it consists of three distinct regions.

**Mesoderm.** See MESOBLAST.

**Mesodonta.** Sub-order of *Bunotheria*, including Eocene mammals with generalized characters, connecting links between the orders *Quadrumana*, *Insectivora*, *Ungulata*, *Creodonta*, and *Tæniodonta*. The molars are tuberculated, more numerous than in Lemurs, which through these forms are linked with the *Creodonta*.

**Mesogloaceæ.** Family of marine brown *Algæ* of the order *Eucœliaceæ*.

**Mesoglœa.** Gelatinous substance which makes up the internal mass of the umbrella of Jelly-fishes.

**Mesohippus.** Ungulate from the Lower Miocene of America, larger than Eohippus or Orohippus, with teeth more equine, three toes, and a splint on the forefoot; one of the ancestors of existing horses. See EQUIDÆ.

**Mesolonggi,** or MISSOLONGHI. In Ætolia, w. Greece, on the Gulf of Patras; valiantly and successfully defended against

Mesolonggi.

the Turks 1822; taken and destroyed April 22, 1826; surrendered to the Greeks 1829. Byron died here 1824.

**Mesonephros.** Wolffian body or kidney of lower vertebrates, in its embryonic stage represented in all vertebrates. It extends from the 12th to the 13th somite in the fowl, and consists of a Wolffian duct connected with one or more pairs of segmental or Wolffian tubules in each somite. Some of these open into the body cavity by peritoneal funnels.

**Mesonero Romanos,** RAMON DE, 1803–1882. Spanish author. *Manual de Madrid*, 1831; *Escenas Matritenses*, 4 vols., 1836–42; *El antiquo Madrid*, 1861. *Works*, 1881; *Remains*, 1883.

**Mesonotum.** Back or tergal portion of the mesothorax of insects.

**Mesophlœum.** Middle or green layer of the bark of an exogenous stem.

**Mesophyll.** Parenchymatous tissue of leaves between the two epidermal layers, consisting generally of the palisade layer above and the spongy parenchyma below.

**Mesopodialia.** Third element of the limb of a vertebrated animal, represented by a proximal and a distal row of bones; viz., the carpalia of the anterior and tarsalia of the posterior extremity.

**Mesopodium.** Central portion of the gastropod foot.

**Mesopotamia.** Region between the Euphrates and Tigris; part of the Turkish empire since 1515; anciently of great agricultural value and historical importance. Area ab. 55,000 sq. m.

**Mesorchium.** Fold of peritoneum which invests the testes.

**Mesostylous.** Heterostylous flowers in which the styles are of a length intermediate between the longest and shortest.

**Mesotheca.** See PERIGONIUM.

**Mesothecium.** Middle layer of cells in wall of an anther-sac.

**Mesothelium.** That part of the mesoblast which originates as diverticula of the ARCHENTERON (q.v.).

**Mesotheria.** Group of placental, deciduate Mammals, nearly equivalent to the SUB-UNGULATA plus the BUNOTHERIA (q.v.).

**Mesothorax.** Middle segment or ring of the insect's thorax.

**Mesotrocha.** Annelid larva with circles of cilia around middle of body.

**Mesozoa** (MESOZOARIA). Those multicellular forms of animals in which there is no true differentiation of tissues. To this group belong forms like the *Dicyemidæ*, *Volvox*, *Proterospongia* and *Magosphæra*. They are connecting links between *Protozoa* and *Metazoa*, and their organization suggests how the passage from the former to the latter may have been effected.

**Mesozoic.** Mediæval time in the Earth's history, often called the Age of Reptiles. Mesozoic strata range from the top of the Palæozoic to the top of the Cretaceous. See COLUMN.

**Mesquite.** See ALGAROBA.

**Messalina,** VALERIA. Third wife of the emperor Claudius, over whom she exercised unbounded influence; infamous for her profligacy and cruelty; put to death for adultery.

**Messana.** See MESSINA.

**Messapian.** Member of a family of languages anciently spoken in s. Italy; used in Calabria till ab. 70 B.C.

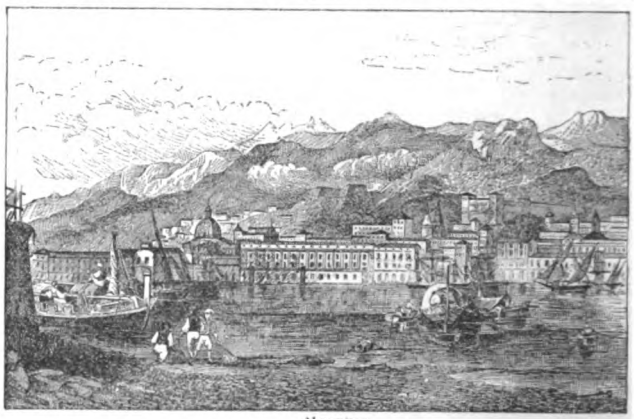
**Messene.** City of s.w. Greece, founded 369 B.C. by Thebans; populous till the Roman conquest.

**Messenger.** See HORSE.

**Messenians.** People of s.w. Peloponnesus, noted for their wars with Sparta, 743–724, 685–668, and 464–455 B.C. They were subdued each time, were heavily oppressed, and at last removed. See MESSENE.

**Messiah.** Saviour and King of Israel, subject of many O. T. predictions from Genesis on; still expected by the Jews, who could not see that these prophecies were fulfilled in Christ.

**Messina.** Anciently Messana; city and seaport, with an excellent harbor, on n.e. coast of Sicily; founded 732 B.C.; razed by Carthaginians 396; held by Mamertines 288–241 B.C., and then by Rome; taken by Saracens in 9th century, by



Messina.

Normans in 11th; held by Spain from the "Sicilian Vespers," 1282, in which 12,000 French were massacred, to 1713; injured by plague 1743, and by earthquake 1783. It revolted against Naples 1848, and was freed by Garibaldi 1860. It has a university, founded 1549, and a large trade, especially in fruit and wines. Pop., 1892, 141,000.

**Messina,** STRAIT OF. Between Sicily and Italy; 26 m. long, 12 m. wide. Here were SCYLLA and CHARYBDIS (q.v.).

**Mestizos.** In S. America, Mexico, etc., persons of mixed blood, usually, or originally, Spanish and Indian.

**Mestome.** Portions of a fiber-vascular bundle which are elements of weakness, as the ducts.

**Mesure à bouts** (END MEASURE). Linear measurement by reference to the distance between two parallel planes constituting the ends of a rod of known length.

**Mesure à traits** (LINE MEASURE). Linear measurement by reference to two fixed parallel lines drawn on a standard rod at a known distance apart.

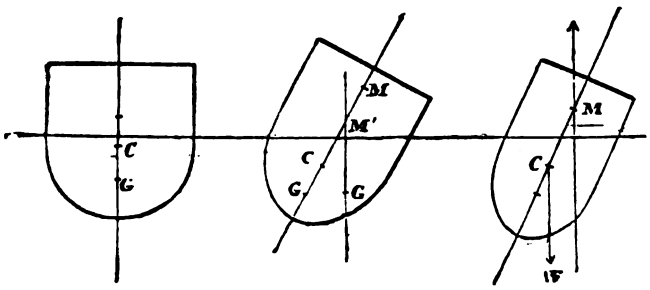
**Meszaros,** LAZAR, 1796–1858. Hungarian minister of war 1848; organizer of the army, and general in the war of independence; in exile from 1849.

**Meta Acids.** Formed from the ortho acids by abstracting one molecule of water; *e.g.*, orthophosphoric acid is $H_3PO_4$, metaphosphoric acid is $HPO_3$.

**Metabolism.** Series of chemical processes which take place in living cells, termed constructive when they act to build up complex substances, and destructive when these are resolved into simple bodies.

**Metacellulose.** Modification of cellulose, soluble in concentrated sulphuric acid, but insoluble in cupro-ammonia, real cellulose being soluble in either.

**Metacenter.** Point of intersection of the axis of symmetry of a floating body with the vertical line drawn through the center of buoyancy, when the body is slightly tipped from



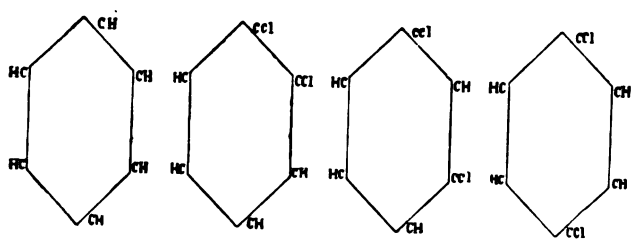

Metacenter.

its normal position. If the metacenter is above the center of gravity of the body, it is in stable equilibrium; ships should be designed so that this will be the case in all circumstances.

**Metachæta.** Permanent setæ, that replace larval setæ in certain annelids.

**Metacinnabarite.** HgS. Mineral with the composition of cinnabar, but differing in color and in crystalline form.

**Meta Compounds.** The di-substitution products derived from benzene form three series called ortho, meta and para. Thus from benzene three dichlorbenzenes are derived. If we consider that the six atoms of carbon in benzene are united in a ring with a hydrogen atom attached to each carbon, then three forms only will be possible, represented conventionally thus:




Benzene Ortho Meta Para

Thus three dichlorbenzenes are theoretically possible, and three are in fact known. Similarly, all di-derivatives of benzene as di-methyl, di-brom, di-hydroxylbenzenes, must fall into these series.

**Metæsthetism.** Theory that consciousness is an evolution of matter, or of material forces.

**Metagenesis.** Alternation of generations, as in Hydroids and other low animals; production of plants or animals bearing sexual organs from a preceding asexual generation, as in the life-history of *Pteridophyta*. See HYPOGENESIS.

**Metakinesis.** See KARYOKINESIS.

**Metaldehyde.** $(C_2H_4O)x$. Acetaldehyde; liquid boiling at 21° C., easily passing without change of composition by the presence of chemical agents into other forms; one of these is metaldehyde, a white solid, changed by heating back into its original form.

**Metaline.** Patented alloy to be used as part or whole of the contact surfaces of light machine bearings; possessing the property of keeping the bearing cool without lubrication and with nearly as little frictional resistance as would exist if lubricant were used. It has been most successful when used on loose pulleys and on textile spindles, but not uniformly so. It is usually applied as small short rods let in radially into holes drilled into the brass of the bearing. One sample was composed of lead 32, zinc 20, carbon 19, silica 6, paraffin 5, copper 3, tin 1.5, balance metallic oxides.

**Metalloids.** Non-metals; obsolescent term.

**Metallurgy.** Art concerned with the extraction of metals from their ores, and refining them. The metallurgist makes use of the principles of chemistry, combined with the physical forces, particularly heat and electricity, which facilitate chemical reactions. Metals occur in three distinct forms, native metals, oxygen ores, non-oxygen ores, and the treatment differs in each case. Native metals occur in ores in the metallic state; they need only a mechanical treatment to separate the metal from the gangue. This treatment may consist in: 1. Crushing the ore and separating the metal by virtue of its high specific gravity, as by washing or jigging, as with copper. 2. Crushing, and heating on an inclined plate, by which the metal is melted and runs down the plate and away from the gangue, as with bismuth. 3. Melting the ore with the addition of a flux; which unites with the gangue, forming slag, which floats upon the melted metal, and can be poured, skimmed, or tapped off, as with antimony. 4. Crushing, and bringing the ore in contact with a liquid metal which can alloy with the metal in the ore, as with gold and silver by the use of mercury. 5. Melting and fluxing the ore in contact with a metal which can alloy with the native metal; silver and gold are thus readily alloyed with lead. 6. Crushing, and dissolving out the metal by an acid or salt solution, the metal being subsequently separated from the solution by precipitation or by electrolysis, as with the sodium-cyanide process for gold.

Oxygen ores are mostly oxides and carbonates, and may be divided into those reducible by carbon at ordinary furnace heats and those reducible by carbon only in the electric furnace; in both classes there are the volatile and the non-volatile metals. In the first class the ores of the volatile metals are mixed with carbon and heated in closed retorts fitted with a condenser in which the metallic vapor is condensed, as with zinc and sodium. With the non-volatile metals the ores are mixed with carbon and a flux, and the mixture smelted either in a crucible, as with antimony; on an open hearth, as in the early extraction of iron; on an inclosed hearth, as with lead and copper; or in a shaft furnace, as with iron, lead, copper and tin: this class of ores is also reducible by mixing with the sulphide of the same metal, the sulphur and oxygen combining and leaving the metal free, as with lead ores. The ores, reducible only in the electric furnace, are mixed with carbon and a metal or the oxide of a metal which is not volatile, a powerful electric current raises the whole mass to a temperature of 2,000° to 3,000° C., and reduction ensues; the result is an alloy of the metal with the other non-volatile metal, as with alloys of aluminium with copper or iron. Such oxides, mixed with carbon and smelted in the electric furnace, yield sometimes the pure metal, but more frequently a compound of the metal and carbon, a carbide, which is in many cases entirely different in its properties from the pure metal, as calcium carbide. Most of the metallic carbides, however, differ from the metals only in being harder, more brittle, and more easily fusible. The pure metal can in many cases be obtained from them by grinding them, mixing with more of the metallic oxide, and again heating in the furnace without admixture of carbon. The carbon in the carbide combines with the oxygen of the oxide, and is thus expelled, leaving the pure metal. Several other methods of attacking these refractory oxides in the electric furnace are: (1) direct reduction by another metal, as silica, heated with powdered magnesium, is reduced to silicon; (2) solution in a molten bath, with reduction by another metal, as manganese in molten cryolite reduced by aluminium; or by electrolysis, as alumina in a bath of melted cryolite; (3) conversion into a non-oxygen compound, and reduction of this by another metal; red hot magnesia with carbon is converted into magnesium chloride by chlorine gas and this is reduced by sodium. Most of the fusible chlorides, fluorides, sulphides, etc., can be directly decomposed by electrolysis, when melted; many of them can be decomposed in aqueous solution by the use of a current of great density, as with chromium salts.

Non-oxygen ores are compounds of the metals with sulphur, arsenic, antimony, selenium or tellurium. Silver is found combined with chlorine, from which it is easily reduced by amalgamation with mercury. The ores are frequently concentrated by crushing and washing or jigging, or by liquation on a hot inclined surface, or by smelting down with flux to molten slag and metallic sulphide (matte) or to an arsenide (speiss). The reduction to metal may proceed as follows: (1) direct reduction by another metal, as lead sulphide melted with scrap-iron; (2) roasting in air, as with sulphide of mercury, thus forming sulphur dioxide and mercury vapor, the latter being condensed; the sulphides of almost all other metals roast to metallic oxide or sulphate; (3) roasting to oxide, with subsequent reduction, as with nickel sulphide; (4) roasting partly to oxide, with subsequent reaction of the oxide on the sulphides, as with lead sulphide; (5) roasting to sulphate, with subsequent solution in water and reduction by precipitation by another metal, as copper sulphate precipitated by iron, or deposition by electrolysis, as with zinc sulphate, or precipitation as oxide,

with subsequent reduction, as zinc sulphide, roasted to sulphate, precipitated by ammonia; (6) direct electrolysis reduces antimony sulphide, when molten; (7) indirect electrolysis, as when ores or the concentrated sulphides are made the anodes in an aqueous solution of some salt of the metal, where, being attacked by the acid anion, they are decomposed and regenerate the solution, the sulphur, etc., being precipitated, as in the treatment of copper mattes; (8) solution of the ore, and electrolysis, as antimony sulphide dissolved in solution of sodium-sulphide, and separated by electrolysis; the ore may also be attacked by acids, and the solution electrolyzed, but such treatment is too expensive, except for the precious metals; (9) decomposition and amalgamation, as with gold and silver sulphides, which are decomposed by chemicals and simultaneously amalgamated.

Almost all the above methods give impure or crude metal. It is refined in the following ways: (1) by distillation, as with mercury; (2) by liquation on an inclined, hot plate, as with tin; (3) by standing, the melted metal often separates into different layers, the lighter impurities coming to the surface, the heavier sinking to the bottom, as with zinc; (4) the melted metal is heated in the air, when the more oxidizable impurities form a dry oxide, and can be skimmed off, as arsenic from lead; (5) superheated steam, or the steam from a pole of green wood, will oxidize and remove some kinds of impurities, as zinc from lead; (6) many chemicals are known to the metal refiner, which act on one metal without attacking another, as sulphur taking iron from lead; (7) chlorine gas removes silver, etc., from molten gold; (8) the metal is made the anode in a solution of one of its salts, all impurities less electropositive remain in the anode, and fall as slime to the bottom of the tank; all forming an insoluble salt with the acid of the bath are likewise precipitated; all electropositive go into solution, but are not deposited on the cathode with a properly regulated current until they accumulate to a great extent in the solution, when the latter must be renewed, as with copper.

**Metals.** In Chemistry, the elements are divided into metals and non-metals. A metal is a substance that has certain properties with which we are acquainted, a certain appearance, luster, etc. In a strictly chemical sense, we call those elements metals which have the power of replacing the hydrogen of acids to form salts. It is not possible to draw a sharp line of division between metals and non-metals, since certain elements, as antimony, have the characteristics of both. The non-metals when combined with oxygen and hydrogen, or hydrogen, generally form acids, while the metals when combined with oxygen and hydrogen form bases.

**Metamere.** Segment of an articulated animal in which the segments or joints follow along a longitudinal axis, in serial order, as in insects and vertebrates. Each metamere is composed of a right and left paramere or antimere.

**Metamerism.** Segmentation of organisms in a linear direction, exhibited by animals whose bodies consist of joints or nearly similar parts repeated in a series along the longitudinal axis of the body; *e.g.*, earthworm, lobster, insect, fish, serpent, man. In the vertebrated animals, metamerism becomes obscured during development so that it is evident in the adult only in the backbone.—In Chemistry, compounds having the same percentage composition and the same molecular weights are called metameric; *e.g.*, alcohol, $C_2H_5.OH$, and dimethylether, $CH_3.O.CH_3$.

**Metamorphism.** Process through which the oldest known rocks have passed and whereby their nature has been changed. There is reason for believing that at one time these strata consisted, as do most stratified rocks, of sandstone, shale, and limestone. But they have been subject to great compression in the presence of moisture and heat, and by these agents a crystalline structure has been produced, accompanied with the development of minerals that were not previously present. The metamorphic rocks now consist of quartz, felspar, hornblende, mica, garnet, etc., and these constituents not unfrequently indicate the method of their formation; but the exact processes through which they have passed are still matters of laborious investigation. One school maintains that all such action was confined to the area during which the Archæan rocks were formed, while the other asserts that metamorphism has occurred among rocks of much later date, and that even some of the Tertiary strata have been involved in the process. The facts, especially as revealed in the Highlands of Scotland, where the battle has long been waged, seem to indicate that as a whole metamorphic beds are of Archæan age, and are due to the causes enumerated above, combined with movement under enormous pressure, but that, when similar motion has taken place in later times under the same conditions, some slight indications of metamorphism may be expected. In the former case the change is called by some writers Regional Metamorphism, in the latter Local.

**Metamorphosis.** Marked changes suffered by certain animals during development; *e.g.*, the change from larva to imago in Insects. Usually it is evolutionary, and a more complex and perfect form arises; but sometimes, as in parasites, there may be retrogressive metamorphosis, which results in a degraded form.—In Botany, development of organs into others performing different functions.

Metamorphos s of the Stag Beetle.

**Metanauplius.** Form transitional between the nauplius stage and the young water flea.

**Metanephros.** Kidney of *Amniota;* formed in the chick from the Wolffian blastema of the 31st to the 34th somite (metamere).

**Metanilic Acid.** $C_6H_4.NH_2.SO_3H$(1:3). Metamidobenzene sulphuric acid; monobasic acid, crystallizing in fine needles or prisms; used in the preparation of the azodye, METANIL YELLOW (q.v), isomeric with SULPHANILIC ACID (q.v.).

**Metanil Yellow.** Sodium salt of the compound, produced by the action of diazometaamidobenzene sulphonic acid on diphenylamine; brownish yellow powder, soluble in water; orange dye-stuff, used in wool-dyeing.

**Metanotum.** Dorsal or tergal portion of the metathorax of Insects.

**Metaphase.** Form of the nucleus during the process of metakinesis. See KARYOKINESIS.

**Metaphor.** Substitution in written or spoken speech of one object for another which it resembles, or is poetically supposed to resemble; figure of speech allied to the Simile, but suppressing the words (usually *like* or *as*) indicating comparison.

**Metaphosphoric Acid.** $HPO_3$. Derived from orthophosphoric acid, $H_3PO_4$, by the abstraction of one molecule of water; made by dissolving phosphorous pentoxide in cold water; vitreous translucent mass, known as glacial phosphoric acid.

**Metaphysical Poets.** Men of learning, whose sole endeavor was to show their learning. The name was applied by Dr. Johnson. Donne and Cowley are examples.

**Metaphysics,** or ONTOLOGY. Science of the nature of existence, as opposed to its laws; contrasted with Phenomenology: sometimes called the science of first principles, whether physical or spiritual; opposed to what is called empirical science in that it investigates the ground, as distinct from the order and causes of phenomena, in so far as causes are conceived to be their antecedents and conditions. See PHILOSOPHY.

**Metaplasis.** Internal differentiation during the development of organisms, so that their parts become more and more complex.

**Metaplasm.** In Cytology, granular substances mixed with protoplasm.

**Metapodials.** Metacarpals and metatarsals. In the Horse, these bones of the 2d and 4th digits are represented only by splints.

**Metapodium.** Posterior portion or lobe of a gastropod foot, bearing the operculum if present.

**Meta River.** In Colombia, S. America; it rises ab. 40 m. s. of Bogota, and empties into the Orinoco. Length, 685 m.

**Metasoma.** Soft part of the body of a Nautilus and allied animals, contained in the shell.

**Metaspermæ.** Plants usually known as *Angiospermæ.*

**Meta Stannic Acid.** $H_2SnO_3$?. White insoluble powder, obtained by treating tin with concentrated nitric acid. It has apparently the same composition as stannic acid. With alkalies it forms salts different in properties from the stannates. It forms two sodium salts, $Na_2Sn_5O_{11}$, $Na_2Sn_9O_{19}$.

**Metastasio,** PIETRO ANTONIO DOMENICO BONAVENTURA (TRAPASSI), 1698–1782. Most famous and prolific of Italian librettists in his day; resident at Vienna from 1730. His opera books, ab. 30, were set to music by the chief composers.

**Metastasis.** Complete and sudden transposition of disease from one part of the body to another.

**Metastoma.** Tongue-like projection from the ventral side of the mouth in *Crustacea;* lower lip.

**Metatheria** (DIDELPHIA, MARSUPIALIA). Sub-class of non-placental *Mammalia,* including the single order *Marsupialia;* distinguished by possessing a marsupial pouch and double generative organs in connection with a sort of cloaca. The various orders of higher mammals are curiously mimicked by different divisions of the Marsupials, especially as to dentition. There are two great divisions, *Polyprotodontia* and *Diprotodontia.* All are Australian, except the Opossums, which are American.

**Metathesis.** See DOUBLE DECOMPOSITION.

**Metathorax.** Posterior segment of insect's thorax.

**Metaurus.** Small river in Umbria, Italy, on which Hasdrubal was defeated and slain 207 B.C.

**Métayer.** System of land tenure in which the landlord furnishes the land and at least a part of the stock, seeds, implements, and fertilizers, while the tenant furnishes the labor and care, giving the landlord some proportion, usually half, of the product.

**Metazoa.** Portion of the animal kingdom whose individuals are characterized by distinct tissues. The egg passes in its development through a gastrula stage, or a stage comparable to a gastrula, more or less modified.

**Metellus,** QUINTUS CACCILIUS. 1. Victor in Macedonia 148 B.C. 2. Conqueror of Jugurtha 109 B.C. 3. Conqueror of Crete 67 B.C. 4. Father-in-law of Pompey, and one of his generals at Pharsalia; d. 46 B.C.

**Metempsychosis.** Transmigration of the soul from one body to another; belief held in many ages and forms, especially in India.

**Meteogram.** Diagram showing graphically all observed changes in wind temperature, pressure and weather; viz., the thermogram, barogram, etc.; sometimes automatically produced by a combination of meteorological self-registers. The term was introduced 1887 by Abercromby.

**Meteorgraph.** Term applied by Neumayer to the apparatus constructed by him 1858 at Melbourne for graphically recording the apparent movements of meteors or shooting stars, and from which the actual motions can afterward be read off at leisure.

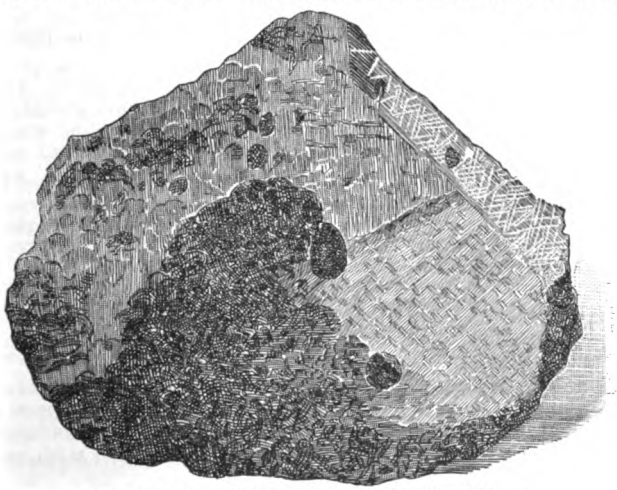
**Meteoric.** Flowers whose opening or closing is influenced by atmospheric conditions.

**Meteoric Iron.** Iron in the metallic state, found in some meteorites.

**Meteoric Showers.** Minute bodies which form shooting stars and revolve about the sun in regular orbits. They move in swarms, forming more or less complete rings, about the sun. When the earth encounters one of these rings the result is a meteoric shower.

**Meteoric Theory** OF SUN'S HEAT. This supposes the sun's energy to be maintained by the meteoric bodies which fall into it. Quantitative determination seems to prove that only a small fraction of the energy can be accounted for in this way.

**Meteorites,** AEROLITES, URANOLITES, or METEORIC STONES. Masses of stone or iron which sometimes fall to the earth from



Meteorite found at Caille, France, 1828; one-sixth size.

the interplanetary space. In composition they are not uniform, that of the meteorite pictured is iron 85.7, nickel 13.2, cobalt 0.55, sulphur 0.23, phosphorus 0.30. The meteoric iron, when polished, develops geometric figures on the surface if treated with nitric acid. Twenty-four of the chemical elements have been found in the various specimens.

**Meteorograph.** Apparatus for graphic record of any meteorological phenomenon. In automatic meteorographs the records are made by direct action of the natural phenomenon upon the apparatus, or in sunshine recorders, barographs, anemometers, etc. This term is frequently restricted to systems of apparatus or confirmations (as Secchi's, Wild's, Baumhauer's) by which many meteorological phenomena are recorded on one sheet of paper.

**Meteorography.** Description of the weather and its phenomena.

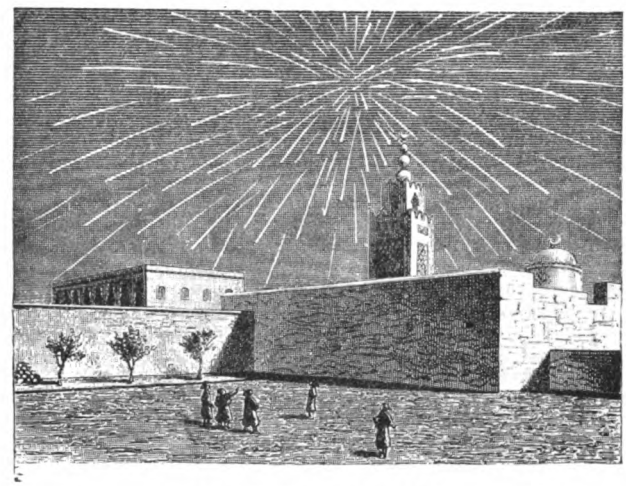
**Meteorological Equator.** Central line of a belt of calms and cloudy, showery weather, that on the ocean nearly corresponds to the geographic equator of the earth, but on the land is sometimes difficult to recognize. The equatorial belts of calms and rains coincide in the Atlantic and lie between 4° N. and 4° S. in March, but between 6° N. and 12° N. in July; hence the axis moves from 0° in March to 9° N. in July. In the Pacific this equator lies but little away from the geographic.

**Meteorological Societies.** Organizations for observing and studying meteorological phenomena. The first of these, as an organization independent of government authority, was that of the Palatinate, organized 1780. The societies of France, England, Scotland, Austria, Germany, and New England have done important work.

**Meteorology.** Study of the atmosphere and its phenomena. According to the specific object in view, it is subdivided into Synoptic, the study of daily weather, which began with Espy; Statistical, that of monthly averages, which as climatology began with Humboldt and Von Buch; Dynamic, that of the movements and the forces which cause them, founded by Ferrel; Practical, the utilization of our knowledge in weather predictions and storm warnings, which began with Henry, La Verier, Fitzroy, and Buys-Ballot; Observational, the art of keeping exact records, which began 1653 in Italy after the thermometer and barometer were perfected; Cosmic, the study of the relations between planetary, solar, and stellar phenomena, or lunar, solar, and astro meteorology.

**Meteoroscopy.** Art of predicting weather by means of the stars.

**Meteors.** Class of luminous bodies known as shooting stars, bolides, or fire balls, entering the earth's atmosphere from without. They move through the air at from 8 to 40 m.



Meteors, seen at Tunis, 1885.

a second, and are of nearly all colors. They can be seen any clear night, but ab. 3 to 4 times the usual number can be seen on the nights of Aug. 10–11.

**Meter.** Primary unit of length in the metric system; originally intended to be the ten millioneth of the distance from north pole to equator along the meridian of Paris. The measurements from which it was derived were made by Delambre and Mechain; the length thus determined was made the standard meter by law of the French Republic 1795. Practically, it is defined to be the length at a temperature of 0° C. of a platinum rod made by Borda and preserved in the French Archives. Copies have been sent out to the different national repositories. According to more recent measurements, the earth's quadrant contains 10,000,880 meters, but the length of the standard will not be changed, and is therefore an arbitrary

unit instead of a natural one as intended. The names of the multiples of the meter take prefixes derived from the Greek, as kilometer, a thousand meters; while those of the sub-multiples are derived from the Latin, as centimeter, one-hundredth of a meter. The meter equals 39.37043196 British inches.

**Meter.** Varieties of verse, common in all ages, according to the arrangement and number of feet in lines or stanzas. The most familiar forms are the iambus, a short and a long syllable; trochee, long and short; spondee, two long; dactyl, long and two short; anapæst, two short and one long. The hexameter, famous in classic poetry, had six feet of one sort or another; the pentameter five, and so on. Long, common, and short meter, familiar in hymns, are iambic, and named from the number of feet. Common meter is that of most old ballads.

**Meter,** ELECTRIC. For measuring and recording the quantity of electricity supplied to customers. In Edison's apparatus for continuous currents, the deposit of metal in an electrolytic cell indicates the quantity of electricity. In Forbes' meter, both continuous and alternating currents heat a wire coil, which creates a current of warm air, turning a windmill, whose revolutions are recorded.

**Meters,** GAS. The wet meter consists of a cylindrical tinplate vessel half filled with water, containing a block-tin drum, divided by four transverse spiral partitions, so arranged that the gas inlet to each quarter is under water when the outlet is above water. The drum space of the meter is separated from the gas inlet space above the water line by a transverse partition. When gas is being used, the gas passes from the gas inlet space through the drum inlet, as it comes above the water line, and by its pressure fills the quarter space, causing the drum to revolve; as the drum outlet comes above the water line on the other side of the meter, the gas passes into the outlet space of the meter to the house pipes, the water taking its place. The revolutions of the drum indicate the amount of gas used, and are shown on a dial by clock work. The dry meter consists of a rectangular tin-plate vessel, containing two cylindrical bellows-like compartments, with rubber sides and tin-plate ends, which are alternately connected by slide valves with the gas outlet of the meter and the gas inlet space outside the compartments, which joins the pipes from the street. When gas is being used the pressure of the gas in the mains compresses that compartment of the meter whose valve to the outlet is open and the gas is forced into the house pipes, and so on alternately. The movements of the tin-plate ends is communicated by rods to the valves. The filling and emptying of the compartments are communicated by clock work to a dial. The error of these meters is not over two per cent, and may be either for or against the consumer.

**Methane.** See MARSH GAS.

**Methodism.** Greatest religious movement within the Protestant world since Puritanism. It began at Oxford 1729, as an association of pious students, chiefly the two Wesleys and Whitefield. On coming forth as preachers, the new evangelists divided in doctrine, the Wesleys being Arminians, Whitefield a Calvinist. Arminianism (except in Wales) has almost alone organized as Methodism. In Great Britain the main Wesleyan body has ab. 635,000 communicants; in the U. S. the M. E. ch. N. and S. has ab. 1,900,000. Adherents of all Methodist organizations throughout the world number ab. 5,121,636. See BISHOP, CONFERENCE, CIRCUIT, PRESIDING ELDER, DISTRICT, ITINERANCY, CLASS-MEETING, etc.

**Methodist Episcopal Church.** Organized in the U. S. by Dr. T. Coke 1784, with 84 preachers; services had been held since 1766. It now has 18 bishops, ab. 16,500 itinerants, over 14,000 local preachers, 140 conferences, 2,530,448 members, 28,000 Sunday-schools, many seminaries and colleges, and foreign missions throughout the world.

**Methodist Episcopal Church South.** Organized 1846. It has 10 bishops, ab. 12,000 preachers, 1,333,210 members, ab. 13,500 Sunday-schools, and missions in China, Japan, Mexico, and Brazil.

**Methodist Protestant Church.** Organized in the U. S. 1830, without bishops. It has ab. 2,600 preachers, and 162,789 members.

**Methodius.** Greek hymnist, patriarch of Constantinople 842; defender of icons. See CYRIL.

**Methuselah.** Seventh in descent from Adam. The biblical genealogy gives him the longest human life, 969 years.

**Methyl.** $CH_3$. Univalent group of atoms containing one atom of carbon and three of hydrogen; conceived to be derived from marsh gas by the removal of one atom of hydrogen $CH_4—H=CH_3$; contained in numerous organic compounds, as methyl alcohol, $CH_3OH$, methyl acetate, $CH_3.C_2H_3O_2$, methyl benzene, $C_6H_5.CH_3$.

**Methylacetanilide.** $C_6H_5N:C_2H_3O.CH_3$. Exalgine; white crystalline solid, melting at 99° C.; produced by the action of acetic anhydride upon methylaniline, or by introducing a methyl group into acetanilide; used in pharmacy.

**Methyl Acetate.** $CH_3.C_2H_3O_2$. Liquid of pleasant odor, boiling at 58° C.; present in crude methyl alcohol, and easily prepared from acetic acid, methyl alcohol, and a dehydrating agent.

**Methyl Alcohol.** $CH_3.OH$. Wood alcohol or spirit, produced by various chemical reactions, but prepared for the trade by the destructive distillation of wood, 2–3 gals. per cord. The liquids produced by this process consist mainly of methyl alcohol, acetone, acetic acid, and water. The acid is neutralized by lime and the alcohol and acetone distilled off. It is a liquid, boiling at 66° C., of characteristic odor. It is used in the arts as a solvent for india-rubber and resins in varnishes, for preserving anatomical specimens, and as a source for the methyl group or radical. Mixed with 9 parts ethyl alcohol, it is known as methylated spirit. Upon oxidation it gives formaldehyde and formic acid.

**Methyl Aldehyde.** See FORMALDEHYDE.

**Methylamine.** $CH_3.NH_2$. Derivative of ammonia in which hydrogen has been replaced by the methyl group; gas with odor and properties of ammonia, present in bone oil and herring brine (?); produced by heating nitrogenous organic matter. It combines with hydrochloric acid to form methyl ammonium chloride. See ETHYLAMINE.

**Methylaniline.** See DIMETHYLANILINE.

**Methylaniline Green.** See METHYL GREEN.

**Methylaniline Violet.** See METHYL VIOLET.

**Methylated Spirit.** See METHYL ALCOHOL.

**Methylbenzene,** or BENZOL. See TOLUENE and BENZENE.

**Methyl Blue.** $C_{37}H_{26}N_3SO_3Na_2$. Sodium salt of the trisulphuric acid of triphenylpararosaline. The base is produced by the action of aniline upon pararosaniline and treated with sulphuric acid. It is a blue powder soluble in water, and dyes cotton upon a mordant.

**Methyl Bromide.** $CH_3Br$. Gas with pleasant ethereal odor, burning with a green flame; produced by the action of phosphorous bromide upon methyl alcohol; used for introducing the methyl group into organic compounds.

**Methyl Chloride.** $CH_3Cl$. Gas with an ethereal odor, prepared by the action of hydrochloric acid gas upon methyl alcohol. It burns with a green flame, and is largely used in the artificial dye-stuff manufacture.

**Methyl Cyanide.** See ACETONITRILE.

**Methylene.** $CH_2$: Group or radical conceived to be derived from methane by the removal of two hydrogen atoms: $CH_4-2H—CH_2$: so methylene bromide is $CH_2Br_2$.

**Methylene Blue.** Either the hydrochloride or zinc chloride salt of tetramethylthionine; blue dye-stuff, containing sulphur, made from dimethylaniline by various very complicated reactions; dark blue powder, soluble in water. It dyes cotton blue, upon a mordant.

**Methyl Eosin.** Several shades of eosins. See ERYTHRIN and SAFFRANINE.

**Methyl Ether.** $CH_3.O.CH_3$. Gas of ethereal odor, produced by the action of hot sulphuric acid upon methyl alcohol. It condenses under pressure to a liquid. It has been used as the volatile liquid in ice-machines.

**Methyl Ethyl Ether.** $CH_3.O.C_2H_5$. Exceedingly volatile liquid, produced by the action of sulphuric acid upon a mixture of ethyl and methyl alcohols.

**Methyl Ethyl Ketone.** $CH_3.CO.C_2H_5$. Bpt. 78° C. Produced in large quantities by the heating of crude acetate of calcium, and present in the liquid obtained by distilling wood; used in the manufacture of chloroform, and as a solvent.

**Methyl Green.** $C_{20}H_{33}N_3Cl_4Zn$. Its base is prepared by the action of methyl chloride upon methyl violet. The commercial product is a union of this base with zinc chloride; green crystals, soluble in water. It dyes silk and wool green, and cotton also upon a tannin mordant.

**Methyl Iodide.** $CH_3.I$. Very heavy liquid, prepared by the action of phosphorous iodide on methyl alcohol. It boils at 44°, has an ethereal odor, and is used as a source for the methyl group.

**Methyl Orange.** See HELIANTHIN.

**Methyl Salicylate.** $C_6H_4.OH.COO.CH_3$. Bpt. 224° C. Principal constituent of oil of wintergreen; prepared artificially from salicylic acid and methyl alcohol; oil with very agreeable odor.

**Methylsulphuric Acid.** $CH_3O.SO_2.OH$. Monobasic acid, prepared from sulphuric acid and methyl alcohol. It closely resembles ETHYLSULPHURIC ACID (q.v.).

**Methyl Violet.** $C_{24}H_{28}N_3Cl$. Pentamethylpararosaniline hydrochloride; violet coloring matter, produced by the oxidation of dimethylaniline, usually with a copper salt; green substance, easily soluble in water. It dyes wool, silk, and also cotton upon a tannin mordant. The very blue methyl violets contain also a benzyl group.

**Metics.** Foreigners in ancient Athens, taxed and regulated by special laws.

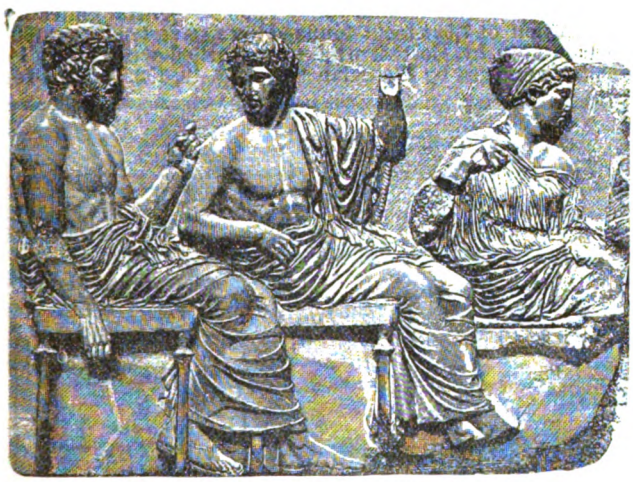
**Metis.** First wife of Zeus. Fearing his child should be wiser and stronger than himself, Zeus devoured her in the first month of her pregnancy, and afterward produced Athene from his head.

**Metonic Cycle.** 235 lunar months=6939d. 16h. 31m., 19 years=6939d. 14h. 27m. Therefore at the end of 19 years the positions of the earth, sun, and moon are very nearly the same as at the beginning. This relation was discovered by Meton, an Athenian astronomer, 433 B.C. It was employed by the Greeks in regulating their calendar, and is still used for determining the time of Easter for the ch. calendar.

**Metonymy.** Figure of speech which puts sign for thing signified, producer for thing produced, instrument for its user, container for contents, and the like; *e.g.*, Shakespeare (for his works): "he smokes a pipe" (for the tobacco in it).

**Metope.** In Doric architecture, space between two triglyphs in the frieze; sometimes left open, but generally filled with panels, either plain or sculptured, as in the Parthenon.

**Metope Sculptures.** Used to decorate the spaces between the TRIGLYPHS (q.v.) of a Greek temple. The oldest extant are at Palermo, from a temple at Selinus, 600 B.C. The next surviving remains are from the Zeus temple at Olympia,



Metope from the Parthenon.

ab.450 B.C. Some of these are still there, others in the Louvre. The most celebrated are from the Parthenon and now mainly in the British Museum. The subjects largely represent combats of Greeks and Centaurs.

**Metric System.** French system of measures, based upon the length of a quadrant of a terrestrial meridian. All scales are decimal. The system is universally adopted in science and based upon the standard METER (q.v.) as a unit of length. See ARE, STERE, LITRE, and GRAMME. WEIGHTS AND MEASURES in Addenda.

**Metrodorus,** 3d cent. B.C. Epicurean philosopher at Athens.

**Metronome.** Instrument used for measuring time in music. It consists of a pendulum with a sliding weight by which the number of beats per minute are regulated. That in common use was perfected by Mælzel 1816.

**Metrophanes,** d. ab.910. Bp. of Smyrna; Greek hymnist.

**Metropolitan.** Presiding bishop of a ch. province; more commonly known as archbishop, though about one-sixth of the R. C. archbishops are not heads of provinces.

**Metropolitan Museum of Art.** Founded in New York City 1872, with a picture gallery of old Dutch and Flemish paintings housed at 681 Fifth Ave., moved 1873 to the Cruger Mansion in West 14th St., where it exhibited the collections from Cyprus excavated by Gen. di Cesnola. In 1879 it occupied its present building in the Central Park, which has since received several large additions; others are contemplated. See CESNOLA COLLECTION.

**Metternich,** CLEMENS WENZEL NEPOMUK LOTHAR, PRINCE VON, DUKE OF PONTELLA, 1773–1859. Austrian diplomatist and statesman; Envoy to Saxony 1801, to Russia 1803, to France 1806; Foreign Minister 1809; negotiator of several important treaties, and of Napoleon's second marriage; founder of the Triple Alliance 1813; Pres. Congress of Vienna 1814; Chancellor 1821–48; long chief director of European affairs. He aimed at peace, but his reactionary policy made no allowance for the tendencies which produced the revolution of 1848 and caused his fall. *Memoirs*, 8 vols., partly tr. 1880–83.

**Metz.** Fortified city of Lorraine, on the Moselle and Seille; besieged by Charles VII. of France 1444; taken by Henry II., April 10, 1552; defended against Charles V. and an army of 100,000 by the Duke of Guise, Oct. 31, 1552–Jan. 15, 1553. In the Franco-Prussian war the chief French army was concentrated here Aug. 10 and 11, 1870; the emperor started for Paris, leaving Bazaine in command, Aug. 14; the battles of Courcelles, Mars-la-Tour, and Gravelotte occurred Aug. 14–18; the French were repulsed in sortie at Courcelles Aug. 26, and defeated Aug. 31 and Sept. 1; sorties were made Sept. 23, 24, 27, and Oct. 7. M. surrendered Oct. 27 with the army, 173,000 men; the Germans entered Oct. 29. It was ceded to Germany May 10, 1871. Pop., 1890, 60,186.

**Metzger,** CARL ALBERT EMIL, 1836–1890. German surveyor in Java 1860–75. *Weltlexicon*, 1888.

**Metzu,** GABRIEL, 1615–1659. Dutch genre painter.

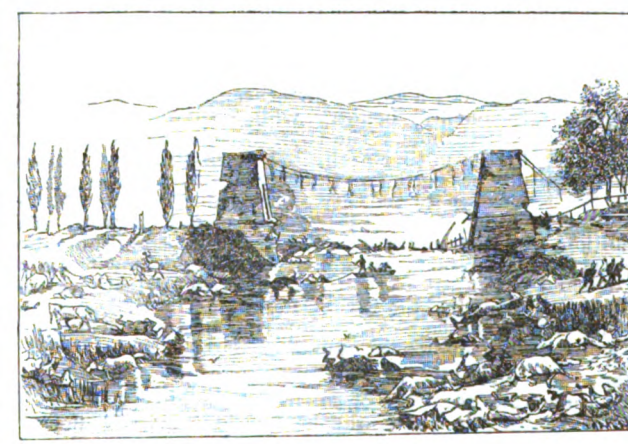
**Meulen,** ADAM FRANÇOIS VAN DER, 1632–1690. Flemish painter, appointed battle painter to Louis XIV. 1666; most of his pictures are in the Louvre.

**Meun,** or **Meung** (CLOPINEL), JEAN DE, ab. 1250–1305. French poet, satirist, and translator. He completed the *Romance of the Rose*, and wrote a *Testament* in verse.

**Meunier,** LEON, 1836–1895. French journalist, in New York 1865–82; long ed. *Courier des États-Unis*.

**Meursius,** JOHANNES (JAN DE MEURS), 1579–1639. Prof. Leyden 1610, and at Sorö, Denmark, from 1625; editor of many classics. *Res Belgicæ*, 1612; *Glossarium Græco-Barbarum*, 1614; *Athenæ Batavæ*, 1625; *Hist. Danica*, 1630. *Works*, 12 vols., 1741–63.—His son, JOHANNES, 1613–1654, was a noted antiquarian.

**Meuse,** or MAAS. River of w. Europe. It heads in e. France,



The Meuse below Sedan.

flows generally across Belgium, and empties into the North Sea near Rotterdam. Length 580 m., drainage area 19,000 sq. m.

**Mexican Art,** ANCIENT. This shows considerable skill in the use of tools, technically considered, but is wholly base in form and limited in aspirations. It reflects the bloody and cruel nature apparent in Mexican religion, of which it is another reflex. Its remains are principally pottery, terra-cotta idols and portraits, and rude stone statues of the gods. Enormous pyramid terraces were built as substructures for shrines, altars, and small temples. Vast ruins of low stone buildings, with elaborate exterior carvings, are found at Palenque, Uxmal, and elsewhere. The study and knowledge of this art are still in their infancy.

**Mexican Indians.** N. Mexico is inhabited by tribes of the SHOSHONE FAMILY (q.v.). Further s. live the descendants of the Toltec-Aztecs, mixed with aboriginal as well as Spanish

blood. They are skillful in making toy images; the majority work for masters on farms or in mines, but under a system of peonage worse than slavery, though nominally all are equal citizens with the whites. The Indian keeps to himself, keeps his distinctive dress, habits, houses, etc., repudiates the white man's civilization, and is proud of his race. The table-land of

Mexican Indians taking Fruit to Market.

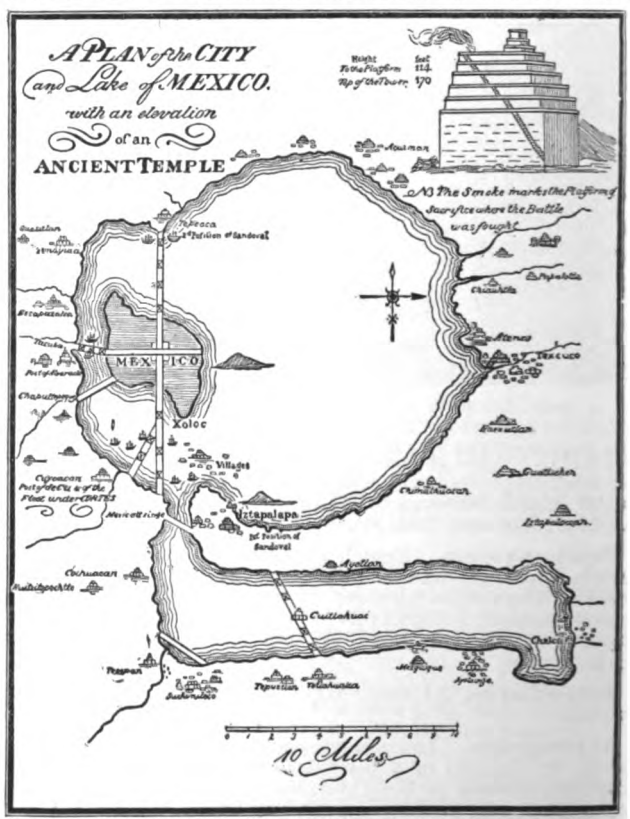
Anahuac is occupied by a pure pre-Toltec tribe, which in some respects is superior to the other Indians. The Zapotecs of Tehuantepec are the finest race: they are graceful and beautiful, never beg or steal, and go bareheaded—an unusual custom with Mexican Indians. The Pintos, near Acapulco, have a blue-brown skin, speckled with irregular white spots; their children are born spotted.

**Mexican Tea.** *Chenopodium ambrosioides.* Ill-smelling herb of the Goosefoot family, native of S. America, widely distributed as a roadside weed.

**Mexican War.** The war between the U. S. and Mexico originated in difficulties connected with the boundary line between Mexico and Texas. Texas was Mexican property till 1836, when it rebelled and declared its independence. Its admission to the Union 1845 precipitated war. Mexico demanded that the river Nueces should be the boundary line, while Texas, now supported by U. S. authority, claimed the Rio Grande as the s. boundary. Gen. Taylor was sent with an army of 5,000, and soon advanced to the Rio Grande. The result of several battles was such as to cause a formal proclamation of war and the increase of the army. One division under Gen. Kearney was sent w. of the Rocky Mountains against the northern provinces of Mexico; a second under Gen. Scott was sent into the heart of the enemy's country, while Gen. Taylor's division still held the Rio Grande. The U. S. forces were successful in battle after battle, until March, 1847, Vera Cruz was reached and successfully besieged, and the way was open to the capital. Gen. Scott marched to the City of Mexico, where he planted the American flag, Sept. 7, 1847. This closed the war. The conditions of peace finally accepted were the establishment of the Rio Grande as the dividing line, the relinquishment of New Mexico and Upper Cal. to the U. S., with free navigation of the Gulf of California and the River Colorado. The U. S. assumed all debts due from the Mexican Government to American citizens, and paid to Mexico the sum of $15,000,000.

**Mexico.** Republic of N. America, s. of the U. S., and extending from the Gulf of M. to the Pacific. The area is 757,760 sq. m. On the e. the land is low, marshy, densely forested, and unhealthy. To this succeeds an upward slope to a high plateau, ranging in elevation from 4,000 to 8,000 ft., which occupies much the greater part of the republic, and bears many high ranges and isolated peaks, among them the volcanoes of Orizaba and Popocatapetl. The w. slope is almost a counterpart of the e., except that the descent is more abrupt and the low coast region is narrower. The peninsula of Lower California is a narrow, plateau-like desert region, sparsely populated. The climate of M. varies with the elevation, from a tropic climate near the coast to a temperate one on the great interior plateau and an arctic one upon the high mountains. Except along the Gulf coast the country is not well watered. Its streams are few and small. It consists of 27 States, one territory (Lower Cal.), and a federal district. The history of M. falls into three principal periods: the ancient, to the conquest by Cortez, 1521; the middle, under Spanish rule, to the struggle for independence, 1821; the modern, to the present time. The term Aztec properly belongs to one of the principal races or kingdoms in that early civilization, while "Nahuan" more accurately describes the whole group of peoples of which the Aztecs and Toltecs were chief. The Spaniards found a culture and civilization in M. which far surpassed anything elsewhere on the Western Continent. They found a nation advanced in the arts of war, of government and the administration of justice, with a high state of progress in agriculture, the mechanical arts, architecture, and sculpture. There are dated records which go back to the 12th century, and recollections of far earlier times. The middle or Colonial period, under Spanish rule, covers 300 years. The attitude of the masses toward the ruling power was "one rather of sullen submission than of active resistance to grinding oppression." The Spaniards regarded the country chiefly as a source of wealth, and the natives were enslaved to produce it. Yet during this period M. became the most enlightened of the Spanish colonies, the natives gathering power and culture from their conquerors. But the spirit of discontent broke into open revolt, at first in 1810 under the leadership of Hidalgo, a priest, and in 1821 independence was proclaimed by Iturbide. The modern period was at first one of serious internal disturbances, Iturbide being proclaimed Emperor, but soon deposed. The struggle has been not only for national independence, but for liberal and republican principles. A liberal constitution was adopted 1824 and abolished 1835, when a consolidated republic was formed with Santa Anna as president but practically dictator. After varying fortunes and civil conflicts M. was occupied by the French 1863, and Maximilian made Emperor; but his reign was short: he was captured and put to death 1867. Juarez returned to the capital and was re-elected Pres.; the liberal constitution of 1857, largely amended, was adopted, and still continues to be the organic law. M. has been involved in one serious conflict with the U. S., 1845–48, involving the loss of Texas, New Mexico and California. Pop., 1893, 12,056,000, one-fifth whites, the balance about equally Indians and half-castes.

**Mexico.** Capital of the republic of M. in a federal district of the same name, in a valley upon the central plateau, at an elevation of 7,524 feet; founded (by native tradition) 1325; occupied 1519 by Cortez, who was expelled with heavy loss 1520, but returned by Tlascalan aid, Aug. 13, 1521, after a four




From the True History of the Conquest of New Spain, written 1568-72 by Diaz del Castillo (q.v.).

months' siege, which nearly destroyed the city. It was occupied by U. S. troops 9 months, 1847–48. A much needed system of drainage was completed 1894. The most notable building is the Cathedral, erected 1573–1645. Pop., 1893, 330,000; of federal district, 478,750.

**Mexico,** Gulf of. Arm of the Atlantic, inclosed by the s. U. S., Mexico and Cuba. Its dimensions are 1,000 by 750 m., with an area of 716,200 sq. m. Its mean depth is 772 fathoms, its maximum depth 2,119 fathoms.

**Meyer,** ADOLF BERNHARD, b. 1840. Director Dresden museums since 1874; writer on ornithology, zoölogy, and anthropology.

**Meyer,** CONRAD FERDINAND, b. 1825. Swiss novelist and poet. *Der Heilige*, 1880.

**Meyer**, EDUARD, b. 1838. German-French ophthalmologist. *Maladies des Yeux*, 1869.

**Meyer,** ERNST HEINRICH FRIEDRICH, 1791–1858. Prof. of botany at Königsburg. *Synopsis juncorum*, 1822; *De plantis Labradoricis*, 1830; *De plantis Africæ australiosis*, 1835–37; *Ueber die Coniferen*, 1841.

**Meyer,** FRANZ JULIUS FERDINAND, 1804–1840. Prof. Berlin. *Phytotomie*, 1830; *Grundriss der Pflanzengeographie*, 1836, tr. 1846; *Neues System der Pflanzenphysiologie*, 1837–39; *Pflanzenpathologie*, 1841.

**Meyer,** GEORGE FRIEDRICH WILHELM, 1782–1856. Prof. Göttingen. *Primitiæ Floræ Essequeboensis*, 1818; *Flora Hanoverana*, 1849.

**Meyer,** GEORG HERMANN VON, b. 1815. Prof. Zurich; writer on anatomy.

**Meyer,** GUSTAV, b. 1850. Prof. of Philology at Gratz 1877. *Albanisische Studien*, 1883–92.

**Meyer,** HEINRICH AUGUST WILHELM, D.D., 1800–1873. German Bible critic. His *Commentary on N. T.* has gone through many editions, and was tr. in 20 vols. 1873–82.

**Meyer,** HERMANN CHRISTIAN ERICH VON, 1801–1869. German paleontologist, author of monographs on the *Amphibia* of the Carboniferous, on the Permian Reptiles, and on the Fauna of the Muschelkalk. In these he enumerates about 80 species of Labyrinthodonts and Reptiles from the Triassic formations of Germany alone.

**Meyer,** JOHANN GEORG, 1813–1886. German painter, prof. Berlin 1863.

**Meyer,** JOSEPH, 1796–1856. German publisher of the *Konversationslexicon* and other important works. His house was removed 1874 to Leipzig.

**Meyer,** JULIUS LOTHAR VON, 1830–1895. Prof. of chemistry at Carlsruhe, 1868, Tübingen 1876, and Göttingen 1885. *Die Modernen Theorien der Chemie.*

**Meyer,** LEO, b. 1830. Prof. Dorpat 1865; writer on Greek, Latin, and Gothic grammar.

**Meyer,** LUDWIG, b. 1827. Prof. Göttingen 1866; writer on mental alienation.

**Meyer,** PAUL, b. 1840. Prof. Coll. de France 1876; editor of old texts; philological writer.

**Meyer,** VICTOR, b. 1848. Prof. of Chemistry at Stuttgart 1871, Zürich 1872, Göttingen 1885, and Heidelberg 1889, succeeding Bunsen at the last. *Aus Natur und Wissenschaft*, 1892.

**Meyerbeer,** GIACOMA (JAKOB LIEBMANN BEER), 1791–1864. Composer whose fame, though a German Jew, rests on his French operas. His musical education was German; his first three operas were German, but failed to make a mark. Discouraged, he resolved to devote himself to the pianoforte. In Vienna Salieri advised him to study opera writing in Italy, where he won success with six operas 1815–24. Until 1830 M. remained inactive in Germany, then went to Paris, where he won phenomenal triumphs with *Robert le Diable*, 1831, *Les Huguenots*, 1836, *Le Prophète*, 1849, *Le Pardon de Ploërmel* (better known as *Dinorah*), 1859, and *l'Africaine*, 1865. The last was begun 1838. In 1842 he was called to Berlin as Musical Director, and there composed *Das Feldlager in Schlesien*, produced 1844, much of the music of which he afterward introduced in *L'Étoile du Nord.*

**Meyfaot,** JOHANN MATTHAUS, 1590–1642. German hymnist; prof. Erfurt 1633.

**Meyn,** ANTOINETTE ("MARIE" and "HOLGER BIRCH"). Norwegian writer of popular tales and sketches. *At Home*, 1881; *Past Times*, 1893.

**Meynell,** WILFRED (JOHN OLDCASTLE), b. 1852. English writer, ed. *Weekly Register*, 1881; *Journals and Journalism;* biographer of Cardinals Manning and Newman and of Pope Leo XIII.—His wife, MRS. ALICE (THOMPSON), is an essayist and poet. *The Roll Call*, 1892; *Color of Life*, 1896.

**Meynert,** THEODOR, b. 1833. Prof. Vienna since 1870; writer on psychiatry.

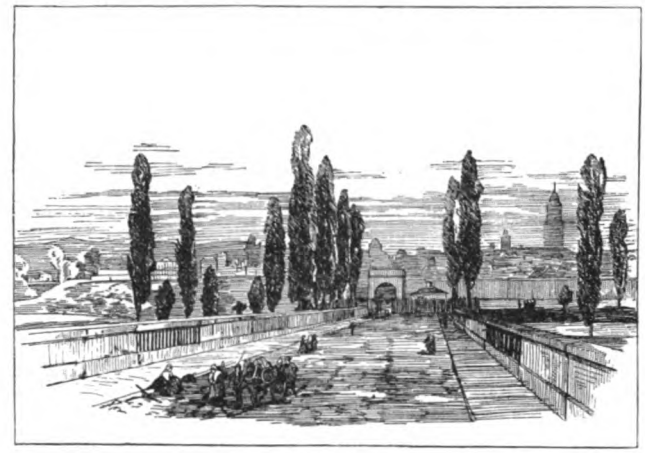
**Meyr,** MELCHIOR, 1810–1871. German novelist. *Stories from the Ries*, 1856–71.

**Meyrick,** FREDERICK, b. 1827. Founder (1853) and sec. Anglo-Continental Society; English theological writer and editor.

**Meyrick,** SIR SAMUEL RUSH, LL.D., 1783–1848. English antiquarian. *Ancient Armor*, 1824–44.

**Mezeray,** FRANÇOIS EUDES DE, 1610–1683. French historian.

**Mézières.** Town of n.e. France, on the Meuse; fortified



Mézières.

by Vauban; besieged by Charles V. 1521, and by the Allies 1815; taken by Germans 1871. Pop., 1891, 6,551.

**Mézières,** ALFRED JEAN FRANÇOIS, b. 1826. French critic; prof. Paris 1863, Academician 1874; author of books on Shakespeare 1861–63, Dante, 1865, Petrarch, 1867, and Goethe, 1872.

**Meziriac,** CLAUDE GASPAR BACHET, 1581–1638. French poet, critic, and editor of several classics.

**Mezzanine.** See ENTRESOL.

**Mezzofanti,** GIUSEPPE CASPARDO, 1774–1849. Italian linguist, prof. Bologna 1797 1831; Cardinal 1838.

**Mezzotint.** Branch of the Graphic Arts, invented by Ludwig von Siegen ab. 1642. A prepared copper plate is first treated by a rocker or cradle, a tool shaped like a chisel, with slightly rounded corners, with the face serrated with teeth like a saw. This tool is held perpendicularly on the plate and rocked to and fro, making fine punctures in the metal, until the plate is so thoroughly pitted that, when it is inked, and an impression is pulled from it, it shows as a uniform velvety black. The design is outlined on the plate, and with a scraper the artist carefully cuts off the points standing on the plate, slowly working his way down to the solid body of the copper, obtaining his tones by removing more or less of the mezzotint ground. Where the ground remains as it was left by the rocker, there is solid black; where it is entirely scraped away, and burnished, there is pure white in the printed impression; the intermediate tones are produced by leaving the pits and burrs more or less as the rocker made them. This process calls for an artist with a keen knowledge of the values of black and white, and one facile with the point, a very different tool and more difficult to handle than the brush. There are few fine examples of pure mezzotints seen in the shops, as most of the plates are first strongly etched in line and afterward mezzotinted. The *Liber Studiorum* plates of Turner were first etched, and after a few impressions were pulled from them were mezzotinted by other hands. The mezzotinter works from dark to light, the opposite to the process of etching, where the workman darkens his plate with every stroke. The softness and richness of the mezzotint can be obtained by no other method. What it lacks is definition and precision in details. From the nature of the process the plate has a short life, as every impression lessens the quality of its tone, though it is possible to get a fair edition from it by steel-facing the plate. See PHOTOGRAVURE.

**Mho.** Unit of electrical conductivity; reciprocal of the ohm, or unit of resistance. By this device the use of very small fractions are avoided when low resistances are being measured. The name (ohm reversed) was suggested by Lord Kelvin.

**Miako.** See KIOTO.

**Miall,** EDWARD, 1809–1880. Founder of the *Nonconformist* 1840, and of the Liberation Society 1844; M. P. 1852–57 and 1869–74; noted for his efforts to disestablish the Ch. of England. *Ethics of Nonconformity*, 1848.

**Miami River.** Right-hand branch of the Ohio. Length 150 m., drainage area 3,636 sq. m. It is not navigable.

**Miami University.** At Oxford, Ohio; chartered 1809, enlarged 1824: not open 1873–84.

**Miantonomoh,** d. 1643. Narragansett chief, allied with the settlers of R. I.; captured and killed by Mohegans.

**Miaotse,** or MIAUTSE. Tribe of s. China, still partially independent; apparently of Siamese origin.

**Miaoulis,** ANDREAS VOKOS, 1770–1835. Greek patriot, naval commander in the war of liberation.

**Miargyrite.** $AgSbS_2$. Valuable silver ore containing sulphur and antimony, and 36.7 per cent silver when pure.

**Mica.** Group of silicates of aluminium and potassium with other bases, remarkable for their easy cleavage in one direction. The micas are common ingredients in many of the older crystalline rocks. When found in veins from which sheets of large size can be obtained, the mineral finds extensive use in the arts. The varieties of highest commercial importance are potassium mica, muscovite, and magnesium mica, phlogopite. In the U. S. the principal mica mines are in N. H. and N. C. The fine refuse is used in lubricants, insulating compounds, and in the manufacture of wall-paper. The sheets are used in stoves and for electrical purposes. The U. S. produced, 1895, 740,000 lbs. ground mica and 6,200 lbs. sheet; the imports were 1,120,221 lbs.

**Micah.** 1. Minor prophet, author of 33d O. T. book. 2. Man of Mt. Ephraim, whose curious story is related in Judges xvii., xviii.

**Mica Schist.** Crystalline foliated rock, consisting of mica and quartz. The easy cleavage is due to a parallel arrangement of the mica scales.

**Micellæ.** Supposed crystals of organized matter of which vegetable cell-walls are composed. They are believed to be prisms with rectangular bases.

**Michael.** Archangel, mentioned Dan. x. 13, 21, xii. 1; Jude, 9; and Rev. xii. 7. Regarded as the head of archangels.

**Michael VIII.** (PALEOLOGUS), ab. 1234–1282. Emperor of the East 1261. He won Constantinople from the Latins 1261, and restored the Byzantine empire.

**Michaelis,** JOHANN DAVID, 1717–1791. Prof. Göttingen from 1746; Bible critic. *Introduction to N. T.*, 1750–88, tr. 6 vols., 1823; *Laws of Moses*, 1770–75, tr. 4 vols., 1810.

**Michaelmas.** Feast of St. Michael and All Angels, Sept. 29; instituted 487; associated with English courts and customs. On this day, the lord mayor of London formerly went by barge on the Thames to Palace-yard in great state. Almost the only survival of the old customs connected with Michaelmas is that of eating goose which still remains in England.

**Michalec,** MARTIN, 1484–1547. Bp. of Bohemian Brethren 1537; hymnist and polemic.

**Michaud,** JOSEPH FRANÇOIS, 1767–1839. French historical writer, especially of *Memoires*, 32 vols., 1836–39. *Crusades*, 3 vols., 1812–22.

**Michaux,** ANDRÉ, 1746–1802. French botanist and explorer, in the U. S. 1785–96. *Chênés de l'Amerique*, 1801; *Flora boreali-Americana*, 1803.—His son, FRANÇOIS ANDRÉ, 1770–1855, pub. *Naturalization des arbres forestiers de l'Amerique*, 1805; *Journal*, tr. 1805; and *N. American Sylva*, 1810–13, tr. 1817–19.

**Michel,** CHARLES HENRI, b. 1817. One of the greatest French landscape painters of the school of T. Rousseau.

**Michel,** DIEUDONNÉ GABRIEL LUCIEN, 1605–1669. French missionary in Canada; superior of Récollet missions 1650: assailant of the Jesuits.

**Michel,** FRANCISQUE, 1809–1887. Prof. Bordeaux from 1839; antiquarian and editor of old texts. *Hist. des Races Maudites*, 1847; *Hôtelleries*, 1851; *Les Écossais en France*, 1862; *Scottish Language*, tr. 1882.

**Michel,** GEORGES, 1763–1843. French landscape-painter whose fame is chiefly posthumous.

**Michel,** JULIUS, b. 1843. Prof. of Ophthalmology at Erlangen 1873, and Würzburg 1879. *Iris-stroma*, 1875; *Augenheilkundo*, 1884.

**Michel,** LOUISE, b. 1839. French communist, transported 1871–80, imprisoned 1883 and 1886. *Memoirs*, 1886.

**Michelangelo** (surnamed BUONARROTI), 1475–1564. Florentine architect, sculptor, and painter; after 1546 intrusted with the continuation of St. Peter's, Rome, and designer of its famous dome. The Palace of the Capitol is one of his buildings; the design of the Farnese Palace is partly his. As architect he represents the tendencies of the middle Renaissance period; his details are consequently cold and mechanical. The statue of *Moses*, which forms part of the tomb of Pope Julius II., in San Pietro in Vincoli at Rome, is his greatest work in sculpture, but the *David* and *Tombs of the Medici* in Florence and the *Captives* of the Louvre, also show his colossal power. As painter his greatest work is the series of frescoes for the *Story of Genesis*, with attendant prophets and sibyls, on the ceiling of the Sistine Chapel, at Rome, begun 1508. The *Last Judgment* on the rear wall of the chapel, begun 1534, shows his wonderful technical capacities in the design of the nude figure and in foreshortening. His oil paintings are few and important only historically. He was also a poet, and his sonnets are renowned. As statesman and politician he took a prominent place in Italian history; as military commander he directed the defense of Florence during the siege of 1529–30.

Moses, by Michelangelo.

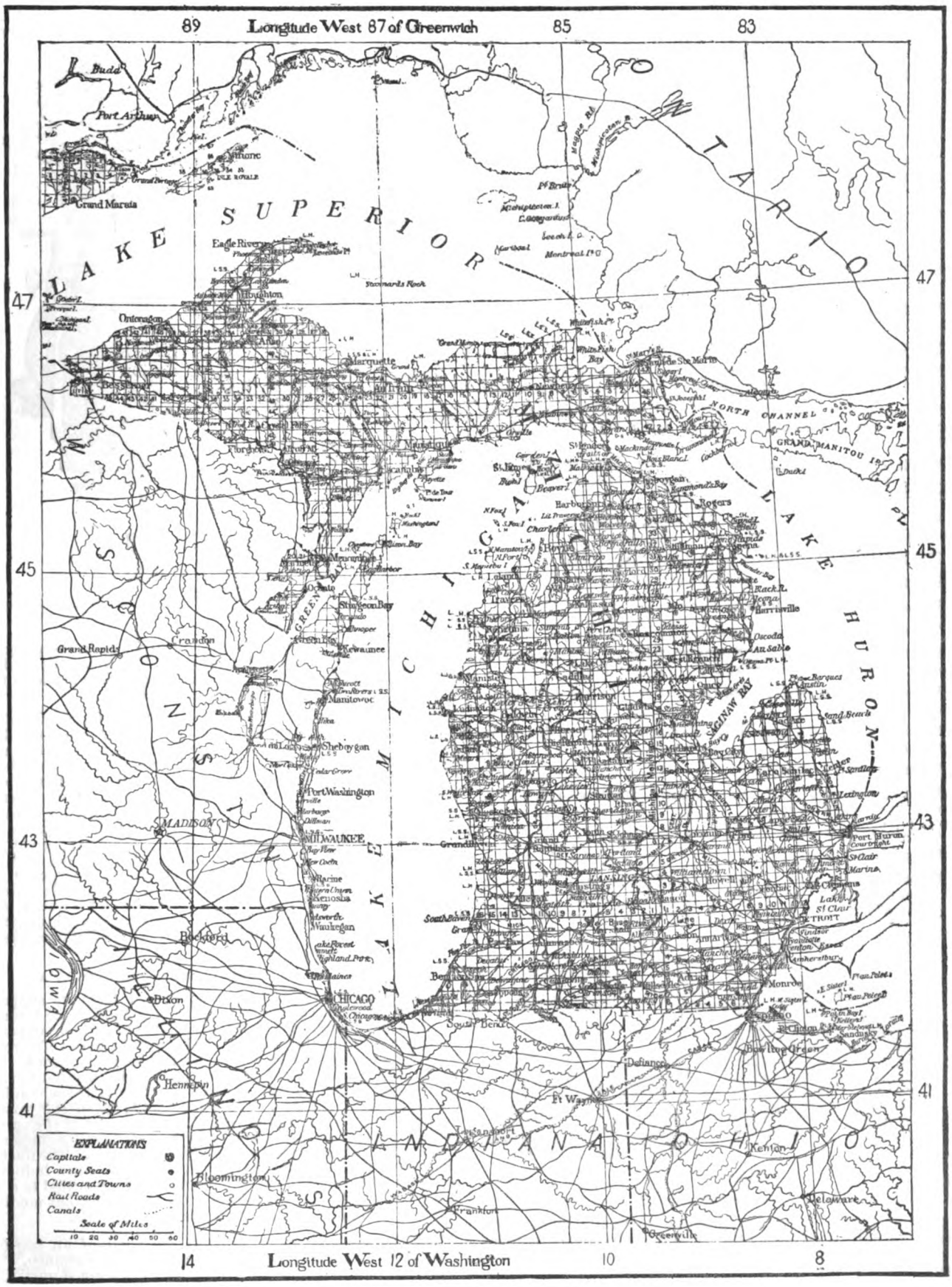
**Michelet,** CARL LUDWIG, 1801–1893. Prof. of Philosophy at Berlin 1829; writer on Aristotle, 1827–36, and on recent German systems, 1837–73.

**Michelet,** JULES, 1798–1874. Prof. Paris 1821–51. Historian of *France*, 18 vols., 1833–67, and of *The Revolution*, 7 vols., 1847–53. *The Bird*, 1856; *The Insect*, 1857; *Love*, 1858; *Woman*, 1860; *The Sea*, 1861; *Bible of Humanity*, 1864; *The Mountain*, 1868.

**Michelozzi,** MICHELOZZO, ab. 1395–ab. 1455. Florentine architect and sculptor.

**Michie,** PETER SMITH, U.S.A., b. 1839 in Scotland. Served in the Civil War from 1863; prof. at West Point from 1867. *Sound and Light*, 1882; *Mechanics*, 1886–88; *Astronomy*, 1893.

**Michigan.** One of the northern central States. It is in two parts, forming the upper and lower peninsulas, the former projecting between Lakes Superior and Michigan, the latter between Lakes Michigan and Huron. Its area is 58,915 sq. m. The surface of the lower peninsula is level or undulating, and in a few places hilly. The upper is more broken, the hills upon Keeweenaw Point being almost high enough to be considered mountains. In the s. portion of the State is considerable prairie. It is, or was before the cutting of lumber began, well covered with forests. Geologically the lower peninsula is almost entirely covered by the Carboniferous formation, areas of Devonian being found in the n. part and in the s.e. On the upper peninsula, near the shores of Lake Superior, are large areas of the Cambrian formation. The s. shore of this peninsula is floored with Silurian; in its central part, extending s.w. into Wis., is a large area of Archæan formations. Its agricultural interests are very large, consisting mainly in the raising of cereals and fruit. The value of farms, farm implements and machinery in 1890 was about $578,373,270, and of farm products in 1889, $83,651,390. The lumber industry is a very important one, the mining industries even more so. On the lower peninsula coal is found, although as yet the production is light. On the upper peninsula are found the most important iron mines in the U. S. The copper mines of the upper peninsula control the markets of the U. S., and produced in 1895 129,740,765 pounds, 77,439,907 of which was from one mine, the Calumet and Hecla. On the lower peninsula are found salt springs, which produced in 1895, by evaporation, 491,167 tons of salt, two-sevenths of the total product in the U. S. M. has large lake fisheries and a very important commerce upon the lakes. In 1892 there were 7,441 miles of railroad


Longitude West 87 of Greenwich
89
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Longitude West 12 of Washington
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LAKE SUPERIOR
LAKE MICHIGAN
LAKE HURON
LAKE ERIE
LAKE ONTARIO
NORTH CHANNEL
GRAND MANITOU IS.
GREEN BAY
SAGINAW BAY
Lake St Clair
Port Arthur
Grand Marais
Eagle River
Houghton
Ontonagon
Marquette
Escanaba
Menominee
Florence
Iron Mt
Manistique
Sault Ste Marie
St Ignace
Mackinac
Harbor Springs
Charlevoix
Petoskey
Alpena
Rogers
Harrisville
Tawas
Alpena
Ludington
Manistee
Muskegon
Grand Haven
Holland
Saugatuck
Sturgeon Bay
Kewaunee
Manitowoc
Sheboygan
Port Washington
MILWAUKEE
Racine
Kenosha
Waukegan
Rockford
Dixon
CHICAGO
Hennepin
Bloomington
Frankfort
Greenville
Kenton
Delaware
Defiance
Ft Wayne
South Bend
Benton Harbor
Port Huron
St Clair
Marine
DETROIT
Monroe
Toledo
Sandusky
Bay View
Grand Rapids
Crandon
MADISON
EXPLANATIONS
Capitals
County Seats
Cities and Towns
Rail Roads
Canals
Scale of Miles
10 20 30 40 50 60

in operation within the State. The capital is Lansing. The chief city is Detroit. M. was originally settled by the French and was held by them till 1760. It was not peopled and developed so early as some of the States further west, owing to false impressions concerning the fertility of the soil and character of the climate. It was organized as a territory 1805 and admitted as a State 1837. Pop. 1890, 2,093,889,

**Michigan,** LAKE. One of the chain of Great Lakes of N. America, between Mich., Wis., and Ill. Its outlet is by Straits of Mackinaw into Lake Huron. Area 21,729 sq. m. Extreme length 545 m., extreme breadth 84 m., maximum depth 870 ft; elevation 581 ft., drainage area 70,040 sq. m.

**Michigan,** UNIVERSITY OF. At Ann Harbor; was established 1837, opened in 1841. A medical department was added 1850, an observatory 1854, a law school 1859, and schools of pharmacy and dentistry later It is supported by a State tax and special appropriations. All departments are open to both sexes. It had (1896) 87 professors, 87 other teachers, and a total of 2,917 students, 1,204 of whom were in the department of arts, 375 in law, 479 in medicine, and 331 in the schools of engineering. The libraries contain 100,000 vols.

**Michigan City.** In Laporte co., Ind., on Lake Michigan, 38 m. e. of Chicago. Pop., 1890, 10,776.

**Michilimackinac.** See MACKINAW.

**Michmash.** Ancient village, 5 m. n. of Jerusalem; mentioned I. Sam. xiii. 11, and elsewhere; capital of the Maccabees.

**Michon,** JEAN HIPPOLYTE, 1806–1881. French priest, noted for eloquence and learning. *Vie de Jesus*, 1865; *Graphologie*, 1874.

**Mickiewicz,** ADAM BERNARD, 1798–1855. Polish poet, resident in France from 1832. *Konrad Wallenrod*, 1828, tr. 1841; *Master Thaddeus*, 1834, tr. 1886.

**Mickle,** WILLIAM JULIUS, 1734–1788. Scottish poet. Tr. *Lusiad*, 1771–75.

**Microbes.** See SCHIZOMYCETES and BACTERIA.

**Microcheiroptera.** See BATS.

**Microcline.** See AMAZON STONE.

**Micrococcus.** See COCCUS BACTERIA.

**Microcosm.** Man as contrasted with the macrocosm or world, yet organized after the type of a world order.

**Microcosmic Salt.** See SODIUM AMMONIUM HYDROGEN PHOSPHATE.

**Microcysts.** Resting forms of swarm-spores of the *Myxomycetes* or slime-moulds.

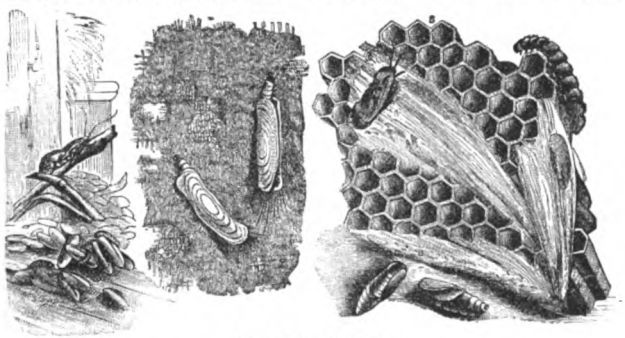
**Microfarad.** See FARAD.

**Microgamete,** or MICROGONIDIUM. Smaller of two cells that are to form a zygote.

**Microgromia.** See GROMIIDEA.

**Microhm.** See OHM.

**Microlepidoptera.** Small *Lepidoptera* with long hair-like antennæ. The caterpillars have five pairs of abdominal legs, provided with a circle of hooks. Some live in leaves



Microlepidoptera.

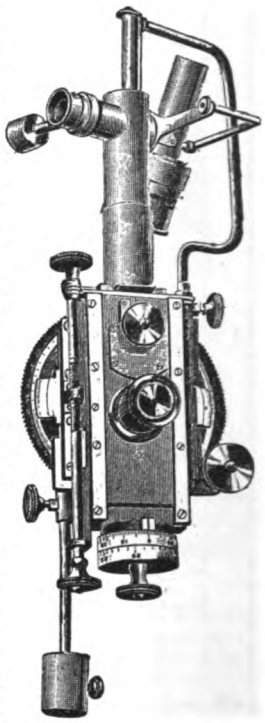
1. Grain moth. 2. Cloth-moth larva. 3. Honey-moth.

rolled together; others bore through leaves and buds. Most are nocturnal. Here belong the Clothes-moth (*Tinea tapezella*), Grain-moths (*T. granella*), and some species that attack fruit trees.

**Microlestes.** Mammalian teeth from the German and English Trias, indicating a very small, insectivorous quadruped, one of the earliest known mammals.

**Micromeres.** Small cells produced by the segmentation of an egg containing much food yolk. They contain less yolk and more protoplasm than any other part of the egg. They form the epiblast.

**Micrometer.** Instrument for making small linear measurements. It is constructed in various forms, on one general principle. One of the common forms is the screw-gauge, which is made by bending a rectangular rod of steel twice at right angles: to one arm is fixed a steel plug with a carefully planed face: through the other arm, opposite the plug, a screw passes, the end of which is plane and may be brought in contact with the plug. To the far end of the screw a milled head is attached, graduated round its edge. If the pitch of the screw be half a millimeter and if there be 500 divisions around the head, clearly the distance between the two plane faces can be determined to within 0.001 of a millimeter. It is used as an attachment to the telescope or microscope for measuring small distances or angles; the more common forms are the filar, double image, and ring micrometers.



Micrometer of Lick Telescope

**Micrometer,** DOUBLE IMAGE. Of various forms, of which for astronomical purposes the heliometer is most effective. See HELIOMETER.

**Micrometer,** FILAR. A thread, usually a spider line, is attached to a frame moved by a screw. Given the distance apart of the screw threads, the distance moved over by any number of turns becomes known.

**Micrometer,** RING. Metallic ring placed in the common focus of the objective and eye-piece. The times of transit of two neighboring objects over the edges give data for determining difference of right ascension and declination.

**Micronesians.** Natives of the Ladrone-Marian, Caroline, and Marshall-Mulgrave archipelagoes. They are of mixed Negrito and Polynesian stock, and show great variation in color, amount of beard, etc. They greet by rubbing noses (smelling) of one another, as is common with both the Papuan and Polynesian peoples. Some tribes are gentle, some are fierce; but cannibalism is not practiced. Some eat dogs, but most are vegetarians and fish eaters. Tattooing is somewhat prevalent, but the hair is not dressed up much. They vary greatly in agricultural and fishing methods and kinds of tools used, but all are good sailors. Their weapons consist of spear, club, and sword set with shark's teeth. Caste is recognized; descent follows the female line, and the oldest woman is queen, with authority equal to that of the king. Ancestral worship abounds, but many are now nominally Christian. Huge Cyclopean relics exist on these islands.

**Micro Organisms.** See MICROBES and PROTOZOA.

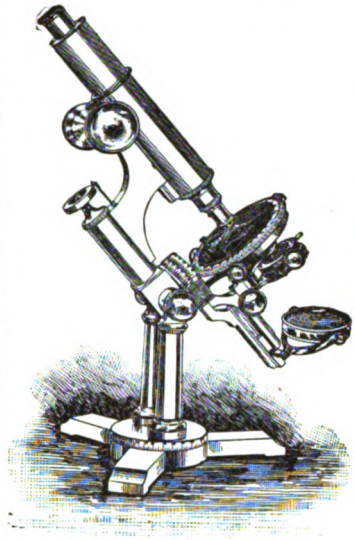
**Microphone.** Instrument so named from its supposed power of detecting the presence of feeble sounds. One form devised by Prof. Hughes 1878 consists of a rod of carbon, supported vertically and loosely between two horizontal pieces of carbon; the whole is attached to a thin vertical sounding-board. The three pieces thus joined are made part of the circuit of the primary of a small induction coil, the secondary of which is in circuit with a telephone. The principle is that of the varying conductivity caused by the variation in pressure at the carbon contacts, the least jar being enough to change the amount of surface in contact or the pressure between them. The fluctuations thus produced in the primary current cause induction currents in the secondary, which may be transmitted to a distance if desired: thus the microphone, in a somewhat modified form, is used almost entirely on telephone circuits.

**Micropyle.** Opening through the shell of an egg (*e.g.* Fishes) by which the spermatozoön may gain entrance. The shells of reptilian and bird's eggs are not formed until after the egg is fertilized, so in them there is no micropyle. See FORAMEN.

**Microscleres.** Small spicules of sponges, of which the

aster, cymba and rosette forms are examples. They are mostly polyaxial.

**Microscope.** Optical instrument for examining very small objects. A simple microscope consists of a double convex lens. If the object be placed a little within the principal focus of the lens, the eye, if placed on the opposite side, will see a magnified erect virtual image of the object, formed behind the lens and further off than the object. A lens of rock crystal was found in the ruins of Nineveh. The compound microscope consists of two converging systems of lenses: the object-glass, which is usually of short focal length and forms a real and magnified image of the object within the body tube of the instrument, and the eye-piece, which forms a further magnified virtual image of the first one. Both the object-glass and the eye-piece are corrected for chromatic and spherical aberration. The dimensions of the instrument and the adjustment of the object should be such that the final image formed shall be at a distance from the eye not less than that of the nearest distinct vision. The magnifying power of a microscope is the ratio of the linear dimensions of the image to those of the object; 2,500 diameters are obtained by the highest powers. The first compound microscope was made by Hans Zansz or his son Zacharias, Dutch spectacle-makers, about 1590.



Microscope.

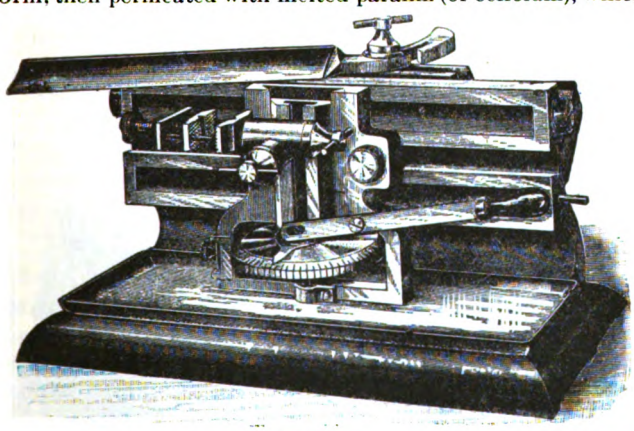
**Microsomata.** Minute corpuscles existing in protoplasm, and especially in the endoplasm of vegetable cells; small aggregations of nucleoli of chromatin granules in a nucleus.

**Microsporangium.** Sporangium which contains microspores in the heterosporous *Pteridophyta*.

**Microspore.** Smaller of two kinds of spore borne by heterosporous *Pteridophyta* and *Sphagna*.—Also applied to minute young produced by the breaking up of the protoplasm of encysted monads.

**Microstylous.** Heterostyled flowers with styles shorter than the filaments.

**Microtomy.** Science and art of making microscopical sections by means of a microtome. The piece of tissue to be examined must first be quickly killed by means of corrosive sublimate solution or some other protoplasm-coagulating reagent; then it is dehydrated in alcohol, next saturated with chloroform, then permeated with melted paraffin (or celloidin), which on hardening admits of being carried by the microtome-clamp. This being raised by minute degrees, the microtome knife, worked by hand or other power, cuts sections $\frac{1}{2000}$ in. thick; these are transferred to a glass slide to which they adhere. The paraffin is dissolved out with xylol, and the sections are stained by one or several aniline dyes, then dehydrated, cleared in oil of cloves followed by turpentine, and finally mounted in solution of Canada balsam. In the study of embryos every section is secured in series by means of the ribbon method. The details of microtomic methods are so varied, so well developed, and undergoing such improvement, that several volumes have been written on the subject.



Microtome.

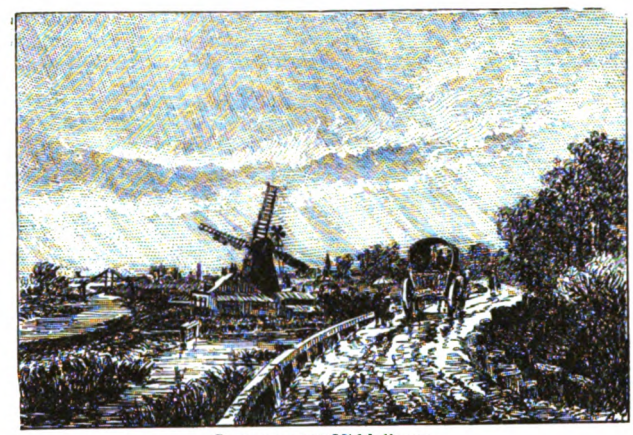
**Microvolt.** See VOLT.

**Micyllus,** or **Molsheim,** JACOB, 1503–1558. Classical teacher at Frankfort 1524–32 and 1537–47; Prof. Heidelberg 1533–37 and from 1547; editor of Lucian and translator of Tacitus. *Silvæ* (Latin poems), 1564.

**Midas.** King of Phrygia, to whom Dionysus granted his request, that whatever he touched should be changed to gold. As even his food became gold, he implored the god to recall his gift. Having decided in favor of Pan in a musical contest with Apollo, Apollo gave him the ears of an ass.

**Midbrain.** Second of the three cerebral vesicles first formed by the medullary folds at the anterior end of vertebrate embryos. From it develops the corpora bigemina (or quadrigemina) of the adult brain. Its cavity becomes the iter.

**Middelburg.** Capital of Zealand; on I. Walcheren; chartered 1225; vainly besieged by Spaniards 1572–74; once commercially important. Pop. ab. 16,500.



Scenery near Middelburg.

**Middelburg,** PAUL, 1445–1534. Dutch mathematician, prof. at Padua; Bp. of Fossombrone 1494; writer on the Calendar.

**Middle Ages.** From fall of Western Empire, 476, to Reformation, 1517; sometimes considered to begin with Charlemagne 768, and end with the Renaissance.

**Middlebury College.** At Middlebury, Vt.; Congregational; chartered1800. It had (1896) ten instructors, 104 students, and 17,000 volumes. Women are admitted to all courses.

**Middle Park.** Elevated valley in Colorado. Its surface is diversified by numerous mountain ranges.

**Middlesborough.** Town of Yorkshire, on the Tees near its mouth; founded 1830, incorporated 1853. It has large iron manufactures. Pop., 1891, 75,516.

**Middle Temple.** See INNS OF COURT.

**Middleton,** ARTHUR, 1742–1787. M. C. from S. C. 1776 and 1780–83; signer of the Declaration of Independence.—His ancestor, ARTHUR, 1681–1737, was Gov. of S. C. 1725–31.

**Middleton,** CONYERS, 1683–1750. English biographer of Cicero, 1741. His *Letter from Rome*, 1729, and *Free Inquiry into Miraculous Powers*, 1748, caused much wrath, and are still memorable.

**Middleton,** THOMAS, ab. 1570–1627. English dramatist. *A Mad World*, 1609.

**Middleton,** THOMAS FANSHAW, D.D., 1769–1822. Bp. of Calcutta 1814. *Doctrine of the Greek Article*, 1808.

**Middletown.** City of Middlesex co., Conn., on the Connecticut, 15 m. s. of Hartford; founded 1650; seat of Wesleyan Univ., Berkeley Divinity School, and the State Hospital for the Insane. Pop., 1890, 9,012.

**Middletown.** City of Orange co., N. Y., on the Wallkill, 67 m. n.n.w. of New York. N.Y. Homeopathic Insane Asylum is here. Pop., 1890, 11,977.

**Midgut.** Digestive part of the alimentary tract, as the stomach and the small intestine; produced later than are the foregut and hindgut in the embryo.

**Midhat,** 1822–1884. Turkish pasha, gov. of several provinces; vizier for two months 1876–77; inprisoned 1881.

**Midian.** Arab people, neighbors to Moab and Israel; descended from Abraham.

**Midlane,** ALBERT, b. 1825. English hymnist.

**Midrash.** Ancient Jewish commentaries on O. T.

**Midrib** (MIDVEIN). Middle strong vein of a leaf.

**Midsummer Day and Night.** The ceremonies so widely practiced in Europe at this season are survivals of pagan customs which are still found in many parts of the world. The day, June 24, is set apart in the calendar as the Nativity of St. John the Baptist. The observances of the festival commence on the previous eve or Midsummer's eve. Souls are then believed to leave their bodies and wander at large, and many popular notions, such as foretelling love and marriage and the approach of death are probably based upon this idea. The fires are built on the hilltops on this eve, and bowers are erected, in which, in England, it was formerly the custom to remain, the next day keeping indoors or abed; the belief was prevalent that thunder and tempest were thus averted.

**Mierevelt,** MICHAEL VAN, 1567–1641. Important Dutch painter of portraits and corporation pictures. He has two fine portrait groups at Delft.

**Mieris,** FRANZ VAN, 1635–1681. Dutch genre and portrait painter of great distinction. Minuteness of execution is car-

Trumpeter, by Mieris, 1672 (Munich Gallery).

ried to the highest point in his pictures. In the art of painting velvet and other rich stuffs he is unsurpassed.—His son, WILLEM, 1662–1747, also had eminent talent.

**Mifflin,** THOMAS, 1744–1800. Delegate to Congress 1774 and 1782–84; Quartermaster-gen. 1775, Major-gen. 1777; Member Constitutional Convention 1787; Gov. of Pa. 1791–99.—His cousin, WARNER, 1747–1798, was one of the first Va. abolitionists.

**Mignard,** NICOLAS, 1606–1668. French portrait painter of distinction, as was his brother, PIERRE, 1612–1695.

**Migne,** JACQUES PAUL, 1800–1875. French priest, founder of *L'Univers*, 1833, and of a great house for the publication of Ch. books and manufacture of Ch. furniture. It was prohibited in vain by the Abp. of Paris, and burned down 1868.

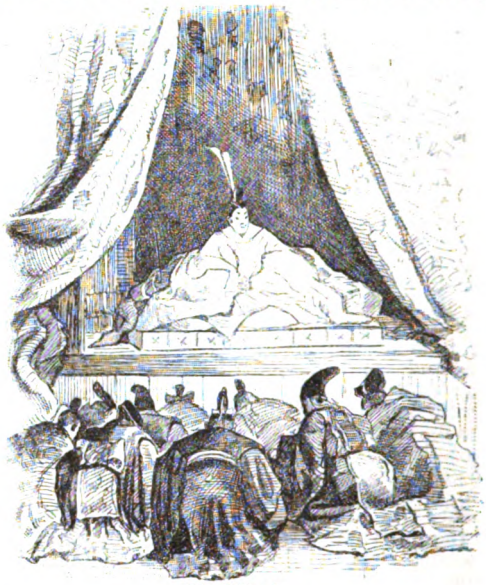
**Mignet,** FRANÇOIS AUGUSTE, 1796–1884. Historian of the French Revolution, 1824, of Mary Stuart, 1851, and of Charles V., 1854; Academician 1836.

**Mignonette.** *Reseda odorata.* Herb of the natural family *Resedaceæ*, native of Europe, extensively planted as a garden flower, and occasionally appearing in waste places as a weed.

**Migration.** In Zoölogy, wanderings of animals and plants especially as connected with change of climate; also wanderings of cells from one part of the body to another. In the blastula, the endoderm is sometimes formed by the migration of cells inward from the outer layer, which may take place at one point (unipolar) or at different points (multipolar immigration). The seasonal migration of birds takes place along water courses, in some cases now extinct (but the old path is followed); with anadromous fishes, it is caused by the necessity for spawning in shallow fresh water and of securing food in the ocean. The irregular migration of the Lemming is due to overcrowding in their original haunts.

**Miguel,** MARIA EVARISTO, 1802–1866. Portuguese prince, son of John VI., in Brazil 1807–21; banished 1824 for plotting against his father; Regent 1826; expelled 1834 for subverting the constitution.

**Mikado.** Title of Japanese emperor, who originally exercised the highest authority in matters civil, military, and religious. In the 13th century the Shoguns, or military chiefs,



The Mikado.

began to assume power, fixing their seat at Yedo while the Mikado lived at Kioto, invisible to his subjects and regarded with superstitious reverence, though without real authority. In 1869 the Mikado was restored to power. See JAPAN, TYCOON.

**Mikhailov,** MIKHAIL LARIONOVICH, 1826–1865. Russian novelist, poet, critic, and translator, banished to Siberia 1861. *Adam Adamovich*, 1851.

**Mikhailovsky-Danilevsky,** ALEXANDER, 1790–1848. Historian of Russian wars.

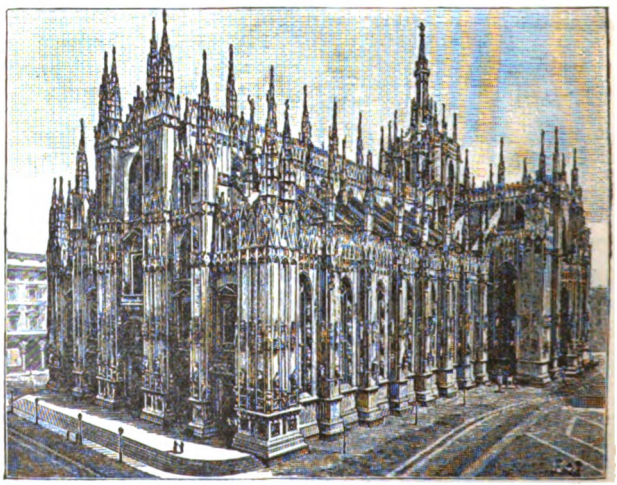
**Miklosich,** FRANZ VON, 1813–1891. Prof. Vienna 1850–86; author of a Slavic grammar, 1852–74, and lexicons 1845–50 and 1862–65.

**Miklukho-Maklai,** NICOLAS VON, 1846–1888. Russian explorer in New Guinea, the Malay peninsula, and sundry Pacific islands.

**Mik-Mak.** Algonquin tribe of Nova Scotia to Maine, once mighty, now reduced to less than 4,000. They retain their primitive customs, and have a fine system of hieroglyphic writing. When Cartier discovered them 1534, they had the sign of the cross, which has given rise to much speculation as to its origin. See ALGONQUINS.

**Mikovec,** FERDINAND BRETISLAV, 1826–1862. Bohemian dramatist.

**Milan.** Chief city of Lombardy, on a plain between the



Milan Cathedral.

Adda and Ticino; noted for its magnificent cathedral of white marble. It has a large trade in silk. It was anciently Medio-

lanum, capital of the Insubrian Gauls; conquered by the Romans 220 B.C.; seat of St. Ambrose's bishopric; destroyed by Goths 539, and by Barbarossa 1162; governed by the Visconti 1277–1447, by the Sforzas 1450–1500, by the French, Germans and Spaniards in irregular succession, and by Austria 1714–96, when Napoleon made it the head of the Cisalpine republic. The Austrians recovered possession 1814, were driven out in the revolution of March, 1848, and came back 4 months after. Insurrections occurred 1849 and 1853. Since 1859 it has been part of Italy. Pop., 1893, 426,500.

**Milan Decree.** In 1806 the British Government declared a blockade of the European coast from Brest to the Elbe, upon which Napoleon retaliated in Berlin Decree by declaring a blockade of the British Isles. In 1807 Gt. Britain issued an order prohibiting American trade with any country from which the British flag was excluded. This called out from Napoleon the Milan Decree, which declared as good prize any vessel which should submit to search by a British ship.

**Milan,** OBRENOVITCH, b. 1854. Prince of Servia 1868, King 1882; defeated in war with Turkey 1876, and with Bulgaria 1885; divorced from Queen Natalie 1888; induced to abdicate 1889 in favor of his son, Alexander I., b. 1876, during whose minority the executive power is held by a regency of three men.

**Milanés,** JOSÉ JACINTO, 1814–1863. Cuban poet and dramatist.

**Mila y Fontanals,** MANUEL, 1818–1884. Prof. Barcelona 1845; writer on Catalan and old Spanish literature.

**Milazzo.** Town on n.e. coast of Sicily, 25 m. w. of Messina; scene of defeat of Carthaginians by Romans 260 B.C., and of Neapolitans by Garibaldi, July 20, 1860. Pop. ab. 8,000.

**Milburn,** WILLIAM HENRY, b. 1823. M.E. preacher, blind from youth; chaplain of Congress 1845, 1853, 1885–93, and of U. S. Senate 1893. *Rifle, Ax, and Saddle-bags*, 1856; *Preacher Life*, 1858; *Pioneers of Mississippi Valley*, 1860.

**Milde,** JULIUS, 1824–1871. German botanist. *De sporarum Equisetorum germinatione*, 1850; *Die höheren Sporenpflanzen Deutschlands und der Schwerz*, 1865; *Monographia Equisetorum*, 1865; *Filices Europæ et Atlantidis Asiæ minoris et Sibiriæ*, 1867; *Bryologia Silesiaca*, 1869.

**Mildew.** Various small parasitic *Fungi*, especially the white moulds.

**Mile.** Itinerary measure, fixed in the 35th year of Elizabeth's reign at 5,280 ft. The following table shows the length of the modern mile and their relation to the English statute mile:

| | Yards | Stat. m. |
|---|---|---|
| English and U. S. statute mile | 1.760 | 1.000 |
| Roman mile | 1,618 | 0.919 |
| Italian mile | 1,808 | 1.027 |
| Ancient Scottish mile | 1,984 | 1.127 |
| Irish mile | 2,240 | 1.273 |
| French posting league (4 kilom) | 4,374 | 2.485 |
| Spanish judicial " | 4,635 | 2.634 |
| Portuguese " | 6,760 | 3.841 |
| German short mile | 6,859 | 3.897 |
| Spanish common league | 7,416 | 4.214 |
| Prussian mile | 8,237 | 4.680 |
| Danish mile | 8,244 | 4.684 |
| Hungarian mile | 9,113 | 5.178 |
| Swiss mile | 8,153 | 5.201 |
| German long mile | 10,126 | 5.753 |
| Swedish mile | 11,700 | 6.648 |

See GEOGRAPHICAL MILE.

**Mileage.** Compensation for duties, or services involving journeying; paid to officials at so much per m. Congressmen formerly estimated their mileage themselves, but now, in order to stop the abuses, the highest allowance is $1,440.

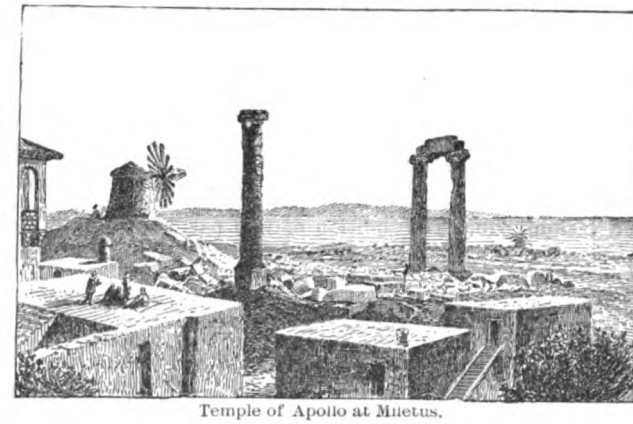
**Milelli,** DOMENICO, b. 1841. Italian poet.

**Miles,** MANLY, b. 1826. Prof. in Agricultural Colls. of Ill., Mich., and Mass. *Manuel of Stock Breeding*, 1879.

**Miles,** NELSON APPLETON, U.S.A., b. 1839. Major-gen. of Vols., Oct. 1865; Major-gen. U.S.A. April 5, 1890. He has rendered distinguished service on many fields in the Civil War, and since in quelling Indian outbreaks; commanded U. S. troops during riots at Chicago, July, 1894, and became commander of the army Sept. 29, 1895.

**Milesians.** Inhabitants of Miletus. The Irish are so styled from a legend that Ireland was conquered and colonized by two sons of Milesius or Miled, a fabled king of Spain.

**Miletus.** Ionian city in s.w. Asia Minor, famous for its woolen fabrics. It became a great maritime power, sent out numerous colonies; was the center of the Ionian revolt:



Temple of Apollo at Miletus.

was destroyed by the Persians 494 B.C., and restored to the Greeks 449.

**Milfoil.** See YARROW.

**Milfoil,** WATER. Aquatic plants of the genus *Myriophyllum*, natural family *Halorageæ*, having for the most part finely divided leaves, widely distributed in temperate regions.

**Milicevic,** MILAN, b. 1813. Servian author.

**Milicz,** ab.1325–1374. Bohemian reformer, active at Prague before Huss.

**Miliolidea.** Order of imperforate *Foraminifera*, with (usually) porcellanous shells, sometimes incrusted and beautifully marked, as if they were perforated.

**Military Academy.** See UNITED STATES MILITARY ACADEMY.

**Military Discipline.** Habit of subordination of the will of the soldier to that of his superiors; inculcated by the rules prescribed and enforced for the conduct of the personnel of armies; the soldier is disciplined when he obeys the will of his commander, even to the sacrifice of his life.

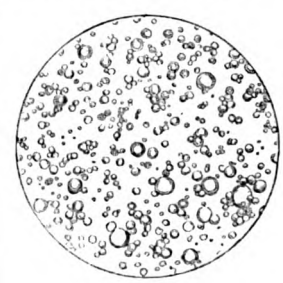
**Military Law.** Body of rules for government of the military forces; resting mainly on international usages and the statutes of each nation.

**Military Service Institution.** Society organized Sept. 28, 1878. Its membership embraces officers and ex-officers of U. S. army, navy, marine corps, and 200 associate members elected by the executive council. It publishes a bi-monthly journal devoted to military subjects, and has its headquarters and museum at Governor's Island, New York harbor.

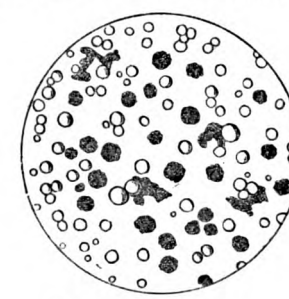
**Military Stores.** Arms, ammunition, clothing, provisions, and supplies, necessary to equip and supply an army. These may be seized by any U. S. officer when in the possession of civilians.

**Militia.** U. S. laws require the enrollment into the militia of all able-bodied males between 18 and 45 years, with certain exceptions. The organized militia force in 1896 comprised 1,407 generals and general staff-officers, 5,061 cavalry, 5,058 artillery, 107,450 infantry, total 118,976; total liable to military duty 10,149,598; naval militia 3,339.

**Milk.** Secretion of the mammary glands of the class *Mammalia*, or those animals that suckle their young. It consists of



Pure Cow's Milk.



Milk of a Diseased Cow.

a watery solution of sugar, earthy salts, and albuminous matter, holding in suspension innumerable microscopic globules of fat.

*Composition of Milk.*

| | Sp.gr. | Water | Casein | Albumen | Fat | Milk Sugar | Ash |
|---|---|---|---|---|---|---|---|
| Human | 1.0270 | 87.41 | 1.03 | 1.26 | 3.78 | 6.21 | 0.31 |
| Cow | 1.0315 | 87.17 | 3.02 | 0.53 | 3.69 | 4.88 | 0.71 |
| Goat | | 85.71 | 3.20 | 1.09 | 4.78 | 4.46 | 0.76 |
| Mare | 1.0347 | 90.78 | 1.24 | 0.075 | 1.21 | 5.67 | 0.35 |

The lowest limit of sp.gr. of pure cow's milk, when regulated by law, is 1.029, and of per cent of fat is 3 to 3.5. The average yield of milk per cow per annum in U. S. is 3,000 to 4,000 lbs., the maximum at the age of eight years. Lactation extends over 300 days. Condensed milk is made by evaporating milk in a vacuum pan. The addition of two parts of water dilutes it to its original strength. It contains sometimes 30 per cent of added sugar.

**Milk Fever.** Slight febrile disturbance accompanying the flow of milk the second or third day after delivery. It very rarely occurs in cases properly managed under antiseptic precautions. It is more common in delicate and weakly women.

**Milk Pea.** Plants of the genus *Galactia*, natural family *Leguminosæ*, natives of America.

**Milk Sacs.** Cells of the latex-system, occurring in certain plants, as in some Maples.

**Milk Sickness.** Poisoning resulting from the ingestion of milk or flesh from cattle suffering from an affection known as Trembles, which is confined to certain parts of N. Carolina.

**Milk Sugar.** See LACTOSE.

**Milk-Vetch.** Plants of the genus *Astragalus*, showy-flowering herbs and low shrubs of the natural family *Leguminosæ*, comprising a very large number of species, widely distributed.

**Milkweed.** Plants of the genus *Asclepias*, coarse herbs of the natural family *Asclepiadaceæ*, of wide geographical distribution; also plants of other genera in the same order, all having a milky sap; known as Silkweed.

**Milkweed,** GREEN. Herbs of the genus *Acerates*, natural family *Asclepidaceæ*, natives of the s. U. S.

**Milkwort.** Plants of the genus *Polygala*, low herbs of wide geographical distribution.

Milkwort (*Polygala comosa*).

**Milkwort,** SEA. See GLAUX.

**Milky Way.** See GALAXY.

**Mill.** In vein mining, opening left in the deads, through which the ore falls to the loading place; also called Pass.

**Mill,** JAMES, 1773–1836. Scottish philosopher, in London from 1802; associated with Bentham; official of e. Indian Co. from 1819; writer for *Westminster Review* and *Encyclopedia Britannica*. His tenets were of the associational school. *Hist. British India*, 1817–18: *Phenomena of the Mind*, 1829; *Mackintosh*, 1835. His *Political Economy*, 1821–22, enunciated the principles of Adam Smith, Malthus, and Ricardo.

**Mill,** JOHN STUART. 1806–1873. Son of James, who educated him on a severe and peculiar system; official of E. India Co., 1823–58; radical M. P. 1865–68; philosopher and political economist, leader of the associational school in psychology, and of the utilitarians in ethics, modifying Bentham's differences only of quantity by differences of quality in pleasure. In political economy he sympathized with the social and humanitarian movement, without departing from Ricardo and Malthus. *Logic*, 1843; *Political Economy*, 1848; *On Liberty*, 1859; *Dissertations*, 1859; *Parliamentary Reform*, 1859; *Representative Government*, 1861; *Utilitarianism*, 1861; *Sir Wm. Hamilton's Philosophy*, 1865; *England and Ireland*, 1868; *Subjection of Women*, 1869; *Irish Land Question*, 1870; *Autobiography*, 1873; *Essays on Religion*, 1874.

**Millais,** SIR JOHN EVERETT, D.C.L., 1829–1896. English painter, pre-Raphaelite and friend of Ruskin; R. A. 1863, Baronet 1885, pres. R.A. Feb. 20, 1896.

**Millard,** HARRISON, 1829–1895. American composer, chiefly of songs.

**Millbank Prison.** In Westminster, London; built 1812–21; disused 1890.

**Milledgeville.** Capital of Ga. till 1868; in Baldwin co., on the Oconee. Pop., 1890, 3,222.

**Milledoler,** PHILIP, D.D., 1775–1852. Pastor in New York 1805–25; pres. Rutgers Coll. 1825–35.

**Millenarianism.** Doctrine which describes the Millennium as a visible, not simply spiritual, reign of Christ on earth, to which the righteous dead are raised, and which is succeeded by the General Judgment; held in many modifications, and by many in almost all Protestant churches.

**Millenary Petition.** Signed by nearly 1,000 Puritans, and presented to James I. 1603, praying for certain ch. reforms. It led to the Hampton Court Conference and the Bible translation of 1611.

**Millennium.** Expected reign of Christ, to last "1,000 years" (Rev. xx.), *i.e.*, indefinitely.

**Miller,** HARRIET MANN (OLIVE THORNE). American ornithologist. *Bird Ways*, 1885.

**Miller,** HUGH, 1802–1856. Scottish geologist, self-taught. In *My Schools and Schoolmasters*, 1854, he described his early life; in *The Old Red Sandstone*, 1841, and other works he gave a lucid and fascinating account of his minute investigations of the Cromarty rocks, and descriptions of the new and curious organisms first brought to light by his hammer. Many of his fishes were described by Agassiz in *Poisson's Fossiles*. He may be considered the founder of the Devonian paleontology of Scotland. *Footprints of the Creator*, 1849; *Testimony of the Rocks*, 1857.

**Miller,** JAMES, 1776–1851. Lieut.-col. 1810; prominent at Chippewa and Lundy's Lane; Gov. of Ark. 1819–25; collector at Salem, Mass., 1825–49.

**Miller,** JOAQUIN (CINCINNATUS HINER), b. 1841. American poet and novelist. *Songs of the Sierras*, 1871. His *Danites*, 1881, was dramatized.

**Miller,** JOSEPH, 1684–1738. English actor, nominal author of a famous jest-book, pub. 1739.

**Miller,** JOSIAH, 1832–1880. English hymnologist. *Our Hymns*, 1866; *Singers and Songs of the Church*, 1869.

**Miller,** OREST, b. 1833. Russian historical and political writer. *Ilia Muromets*, 1869.

**Miller,** PHILIP, 1691–1771. Gardener at Chelsea, England. *Gardener's Dictionary*, several editions, 1731–1804.

**Miller,** SAMUEL FREEMAN, LL.D., 1816–1890. Justice U. S. Supreme Court from 1862. *Lectures on the Constitution*, 1891.

**Miller,** WARNER, b. 1838. M.C. from N. Y. 1879–81; U. S. Senator 1881–87; Republican candidate for governor 1888.

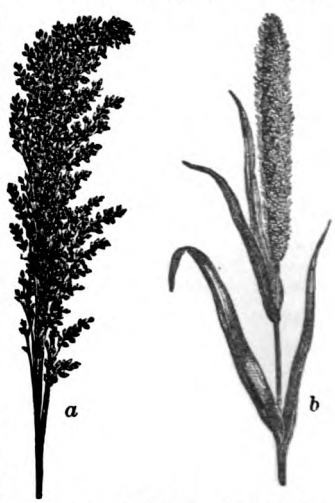
**Miller,** WILLIAM, 1782–1849. American layman, founder of Second Advent organizations 1831–43.

**Miller,** WILLIAM, 1795–1861. English officer, prominent in the Peruvian war of liberation 1817–25. *Memoirs*, 1828.

**Miller,** WILLIAM HALLOWES, 1801–1880. Prof. of Mineralogy at Cambridge 1832. His investigations and writings on crystallography laid anew the foundations of that branch. *Crystallography*, 1839–53.

**Miller,** WILLIAM HENRY HARRISON, b. 1840. U. S. Atty.-gen. 1889–93.

**Millerites.** Followers of WILLIAM MILLER (q.v.). Also called ADVENTISTS (q.v.).




*a*, Common Millet (*Panicum miliaceum*); *b*, German Millet (*Setaria germanica*).

**Millet.** Species of Grasses bearing edible grain. *Panicum miliaceum* is supposed to be the Millet of Scripture. *Chamæraphis italica*, of s. Europe, is extensively cultivated under the name Millet. *Sorghum vulgare*

also bears the name. *Panicum germanicum* is a forage plant requiring a warm temperature and a rich, well-prepared soil for its best development. It is an annual, and, when conditions are favorable, of very quick growth. It produces a forage about equal in character to timothy hay, but must be cut before the seeds have matured, as they have an injurious effect upon some animals, especially horses.

**Millet,** AIMÉ, 1819–1891. French sculptor.

**Millet,** FRANCIS DAVIS, b. 1846. N.A. 1885. American genre and figure painter; important functionary at the World's Columbian Exposition, Chicago, to whose artistic success he very largely contributed; authority on antique costume.

**Millet,** JEAN FRANÇOIS, 1814–1875. French painter of peasant life; of deeply serious purpose and great technical power. His *Angelus* is world-renowned. The *Pig-stickers* and many others of his best paintings are owned in the U. S.

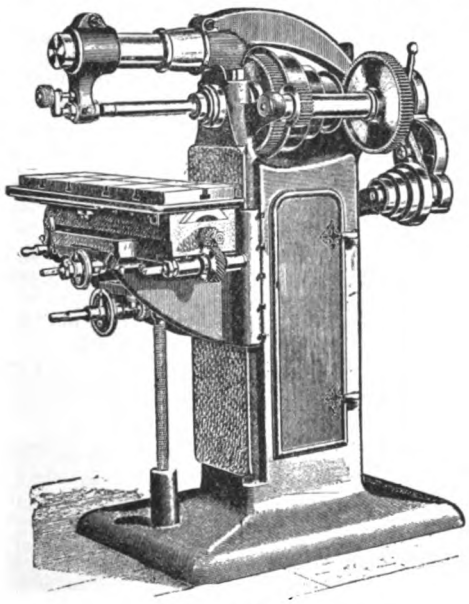
**Milliard.** 1,000,000,000 of money, usually francs. Five were paid by France to Germany 1871–73 as war indemnity.

**Milli-Cassone,** GIANNINA, b. 1827. Neapolitan poet and teacher, noted chiefly for her improvisations. *Works*, 1862–63.

**Milligan,** WILLIAM, D.D., 1821–1894. Prof. Aberdeen 1860; commentator. *Resurrection*, 1881–94.

**Milliken's Bend.** In La., n. of Vicksburg; scene of a Confederate attack and repulse June 1863.

**Milling Machine.** Tool operating with a rotating cutter upon the work, which is fed to it by being secured to a table which receives the feed motions from the spindle or by hand. Older types gave but one feed motion to the table, and the spindle or mandrel for the rotating cutter was adjustable by hand; some of the modern types for heavy work are of this design. Increase of feed motions extended the scope of the tool successively until the present universal machine has feed motions in every direction, though not all of same amplitude. For the sake of exactness of dimension the spindle is not made



Milling Machine.

adjustable vertically, but provision is made to take up lost motion. The advantages of the machine as a tool are that it will work to very close dimensions, even $\frac{1}{1000}$ inch; it reproduces the size and shape for which it has been adjusted as long as the cutters do not require re-grinding; hence one attendant of moderate skill can oversee a number of machines for manufacturing, as no measuring is required, nor the time for it. Modern sewing-machine and arm manufacture is based on these capacities of this tool in its various forms. For very large work, such as facing the ends of bridge-chords, a large machine is used, the cutting teeth being inserted in a heavy rotating disk.

**Milliograph.** Machine consisting of a self-inking pad, a paper stencil and roller, for producing a great number of copies of letters and drawings very rapidly and cheaply. It is either autographic, type-written or stamped, and is used at the Signal Service Stations for printing daily weather maps and bulletins.

**Millipedes.** See CHILOGNATHA.

**Millipores.** See HYDROCORALLIÆ.

**Mills,** ABRAHAM, 1796–1867. Prof. Madison Univ., N. Y.; editor of text-books. *Rhetoric*, 1854.

**Mills,** CLARK, 1815–1883. American sculptor, wholly self-taught. His statues of *Washington* and *Lafayette* are in Washington, D. C.; that of *Liberty* is on the dome of the Capitol.

**Mills,** DARIUS OGDEN, b. 1825. Capitalist; founder Bank of Cal., and its pres. 1864–73 and 1875–78.

**Mills,** ROBERT, 1781–1855. State architect and engineer of S. C. 1820; U. S. architect 1830–41; designer of the Treasury, Post-Office, and Patent Office buildings, and of the Washington Monument.

**Mills,** ROGER QUARLES, b. 1832. M. C. from Texas since 1873, framer of the tariff of 1893.

**Mills,** SAMUEL JOHN, 1783–1818. American promoter (almost founder) of foreign missions.

**Mills,** SEBASTIAN BACH, b. 1838 in England. Pianist in New York since 1859.

**Mill Springs.** In Wayne co., Ky.; scene of a victory of Unionists under Gen. Thomas, Jan. 19, 1862. The Confederate Gen. Zollicoffer was killed.

**Millstone Grit.** Group of English Carboniferous, containing hard, gritty sandstones, which are used for millstones; probably equivalent of the Pottsville conglomerate of Pa.

**Millville.** City of Cumberland co., N. J., 40 m. s. of Phila. Pop., 1890, 10,002.

**Milman,** HENRY HART, D.D., 1791–1868. Poet and historian; prof. Oxford 1821–31; Dean of St. Paul's, London, 1849. *Fazio*, 1815; *Samor*, 1818; *Fall of Jerusalem*, 1820; *Martyr of Antioch*, 1822; *Belshazzar*, 1822. His *History of the Jews*, 1829, of *Christianity* (to ab. 325), 1840, and of *Latin Christianity*, 6 v., 1854–56, were the first English works of the kind written in a strictly unpartisan and scientific spirit. A few hymns of his are widely used. *Annals of St. Paul's*, 1868.

**Milmore,** JOSEPH, 1842–1886, and MARTIN, 1844–1883. Sculptors of Irish birth, whose work is chiefly in and near Boston. Martin modeled many busts of eminent New Englanders.

**Milne,** JOHN, F.R.S., b. 1848. English geologist, in Japan since 1875. *Earthquakes*, 1886.

**Milne,** WILLIAM, 1785–1822. Scottish missionary at Malacca. *Mission to China*, 1820.

**Milne-Edwards,** HENRI, 1800–1885. Prof. Paris; of English descent. *Zoologie*, 1834–51; *Crustaces*, 1828–41; *Coralliéres*, 1857–60; *Physiology and Comparative Anatomy*, 14 vols., 1857–83; *Mammalia*, 1871.—His brother, FRÉDÉRIC GUILLAUME, was an eminent ethnologist.—His son, ALPHONSE, b. 1835, prof. Paris 1865, has pub. much on anatomy, zoology, and paleontology.

**Milner,** JOHN, D.D., 1752–1826. English R. C. bishop *in partibus*, vicar apostolic 1803–23. *End of Controversy*, 1818.

**Milner,** JOSEPH, 1744–1797. Author of a *History of the Church*, 1794–99, continued 1803–9 by his brother ISAAC, D.D., 1751–1820, Dean of Carlisle 1791. The work was long popular, but is narrow and partisan.

**Milnes,** RICHARD MONCKTON, LORD HOUGHTON, 1809–1885. English poet, critic, and biographer of Keats, 1848; made Baron 1863.

**Milo,** TITUS ANNIUS, d. 48 B.C. Roman demagogue, tried 52 B.C. for murdering the tribune Clodius, and vainly defended by Cicero in a famous oration.

**Milon,** 6th cent. B.C. Wrestler of Crotona, s. Italy, of enormous strength; frequently victor at the Greek games; General against Sybaris 511 B.C.

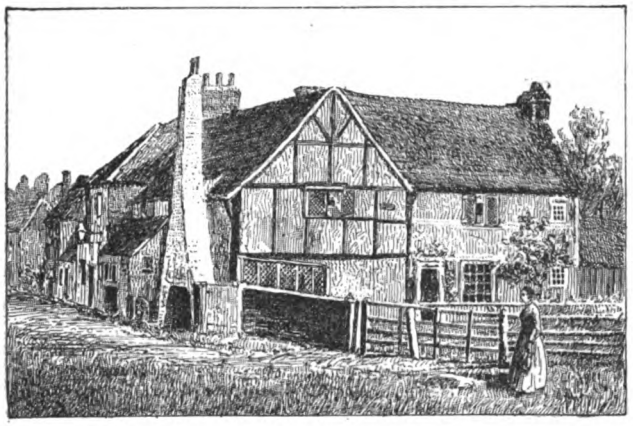
**Milrei.** Portuguese coin of 1,000 reis; unit of the system since 1835; worth ab. $1. The Brazilian milrei has half that value.

**Milroy,** ROBERT HUSTON, b. 1816. Circuit judge of Ind. 1851; Brig.-gen. U. S. Vols. 1862, Major-gen. 1863–65. He held Winchester, Va., against Lee June 15-17, 1863.

**Milsand,** JOSEPH, d. 1887. French interpreter of Browning. *English Æsthetics; Litterature Anglaise et Philosophie*, 1893.

**Miltiades.** Athenian commander at Marathon 490 B.C.; afterward imprisoned and fined for improper use of a fleet in attacking Paros.

**Milton,** JOHN, 1608–1674. Greatest of English epic poets; educated at Cambridge 1625–32, resident at Horton till 1638. His *Hymn on the Nativity, L'Allegro,* and *Il Penseroso,* were early productions: *Comus* was acted 1634, *Lycidas* written 1637. After a year in Italy he settled in London, and plunged into political and religious controversy, writing many brilliant tracts, some of which, especially *Areopagitica,* 1644, rendered immortal service to liberty. Unhappy domestic experience led to



John Milton's Cottage at Chalfont St. Giles, Bucks.
Here Milton finished *Paradise Lost* and began *Paradise Regained.*

*The Doctrine and Discipline of Divorce,* 1645. He defended the execution of Charles I., and was Latin Secretary to the Council of State 1649–60, though blind from 1654. At the Restoration he was in danger, and thereafter under a cloud. *Paradise Lost* appeared 1667, *Paradise Regained* 1671, *Samson Agonistes* 1671, and a *History of Britain* 1670. *Doctrina Christiana,* brought to light 1823–25, displays Arian opinions. His fame, like that of Shakespeare, was mainly posthumous.

**Milton College.** Seventh day Baptist institution at Milton, Wis. It was opened 1844, is co-educational, and has 9 professors.

**Milwaukee.** Capital of Milwaukee co., Wis.; largest and handsomest city in the State; on Lake Michigan, 80 m. n. of Chicago. It is regularly laid out, supplied with water from the lake by pumping, and has excellent railroad communications and a large lake commerce. Among its leading manufactured products are beer, leather, iron and steel, flour, and clothing. Pop., 1890, 204,468.

**Mimæ,** or MIMES. Form of Greek and Latin comedy, farcical in type and coarse in character; popular at Syracuse ab. 420 B.C., and at Rome ab. 50 B.C.

**Mimetite.** $3Pb_3As_2O_8,PbCl_2$. Lead arsenate and chloride, resembling pyromorphite in crystalline form.

**Mimicry.** Imitation, of one species of animal by another, as to shape and coloring, or imitation of the surroundings by animals. A harmless species may, by imitating a poisonous species, secure as great protection as animals do by resemblance to the soil or foliage that forms their background. Mimicry also enables predatory species the more readily to secure their food. The spots of the leopard and python conceal them amid foliage, and the stripes of the tiger amid the canes of the jungle. The zebra's stripes help to hide it from its enemy the lion.

**Mimnermus,** 7th cent. B.C. Greek poet of Colophon, w. Asia Minor, noted for his amorous elegies.

**Min.** Egyptian god of the desert and of travelers; sometimes identified with Pan.

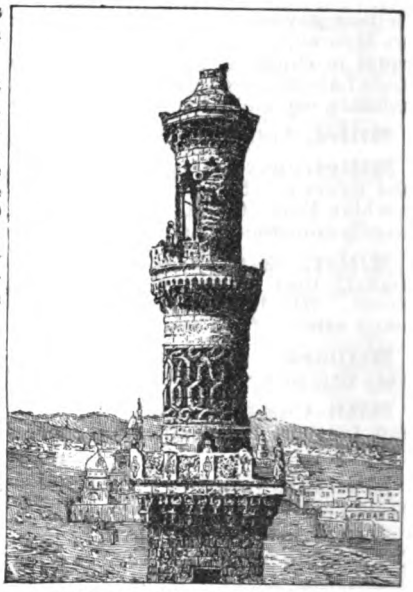
**Mina.** Ancient Greek weight and coin, equal to 100 drachmæ or $\frac{1}{60}$ talent.

**Mina,** FRANCISCO, 1782–1836. Spanish leader in resistance to the French 1809–13, and of revolts 1814, 1820–23, and 1830.—His nephew, FRANCISCO JAVIER, 1789–1817, was associated with him 1809–10, went to Mexico 1817, led a force of insurgents, and was executed.

**Minaev,** DMITRI, b. 1835. Russian poet and translator.

**Minard,** CHARLES JOSEPH, 1781–1870. French engineer, writer on roads and bridges.

**Minaret.** Tall and narrow turret on a Mohammedan mosque, in several stories, with balconies whence the muezzin calls to prayer.



A Minaret of the Mosque of Sultan Berkook, Cairo.

**Minchiate.** Tarot cards of Florence, 97 in the pack, of which 41 bear symbolic designs. These comprise the symbolic cards of the Venetian series, with 20 additional emblems. Tradition credits its invention to Michelangelo's aiming to teach children arithmetic.

**Mincio.** River in n. Italy, near which the French defeated the Austrians Dec. 25–26, 1800, and Feb. 8, 1814.

**Minckwitz,** JOHANNES, 1812–1885. Prof. Leipzig 1861. *Verskunst,* 1844; *Mythologie,* 1852.

**Mind.** See PSYCHOLOGY.

**Mindanao.** Most s.e. and second largest of the Philippine Islands. The interior is unknown. Here Magellan first landed, April 8, 1521. Area 33,260 sq. m. Pop. 600,000.

**Mind Cure.** See SCIENCE, CHRISTIAN.

**Mindeleff,** COSMOS, b. 1863. American ethnologist, writer on Pueblo architecture. He is best known as a modeler of archæologic and topographic subjects. *Pueblo Architecture; Tusayan and Cibola.*

**Mindeleff,** DIMITRI, ab. 1810–1892. Russian-American chemist, inventor of the explosive terrorite and of methods for the reduction of cobalt and nickel ores and the destruction of phylloxera by pyroligneous acid.

**Minden.** Town of Westphalia, on the Weser, dating from ab. 700; scene of a French defeat by Hanoverians and English Aug. 1, 1759. Pop., 1891, 20,223.

**Mindererus.** Solution of acetate of ammonia used in febrile diseases; also used as an eyewash and in cases of mumps.

**Mind Reading.** Popular name for what is also variously described as mental suggestion, telepathy, and thought transference. In a common experiment, the thoughts of the agent are concentrated upon some particular action, his hands at the same time being placed upon the mind reader. The latter is then frequently able to repeat the action thought of, but it has been shown that the suggestion is derived from muscular action, and that "muscle reading" is the more correct designation.

**Mine.** Distinguished from a quarry, or open workings; complex of underground excavations, made in the extraction of metallic ores, coal, salt, or other minerals of value. The legal definition of the term differs in different countries. In some, regard is had entirely to the mode in which the mineral is obtained, and not to its chemical or geological character; in others, the use of the word is limited to operations, whether above or below ground, on deposits containing a valuable metal or ore.

**Mine Pumps.** These differ from ordinary pumps mainly in the additional appendages made necessary by the fact that the water has to be raised from unusual depths, or contains mineral matter likely to be injurious to the working parts. The common lifting pump finds little use in mines, except in a subordinate way.

**Mineral.** Natural, homogeneous, inorganic substance, exhibiting certain definite morphological, physical, and chemical properties. The word is somewhat loosely used, as when contrasted with the vein-stone or when applied to material of undoubted organic origin.

**Mineral Caoutchouc.** Elastic bituminous substance, which has been found in small quantities at several localities; probably not a definite mineral species.

**Mineral Charcoal.** Soft, sooty coal, with a structure resembling woody fiber, frequently met in thin layers in bituminous coal mines.

**Mineral Deposits.** See ORE DEPOSITS.

**Mineralization.** In Botany, accretion of silica or lime salts upon the cell-wall, as in the stems of Grasses and of Horsetails.

**Mineralogy.** Science that deals with minerals; descriptive mineralogy covering the study of crystalline form and molecular structure, physical properties, chemical composition and relations, classification, geographical distribution, and geological occurrence: determinative mineralogy that of the methods employed in identifying minerals.

**Mineral Oil.** See PETROLEUM.

**Mineral Pitch.** Common name for asphaltum or bitumen.

**Mineral Springs.** See SPRINGS.

**Mineral Tallow.** See HATCHETTITE.

**Mineral Tar.** See BITUMEN.

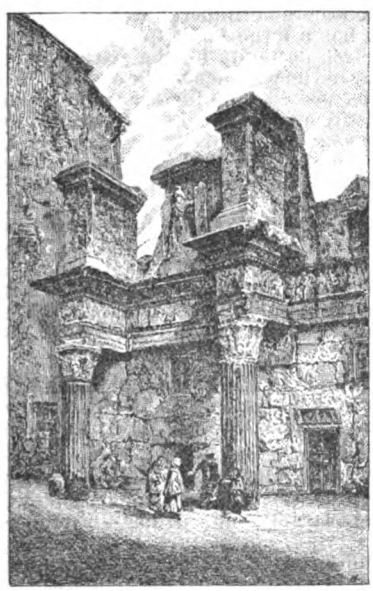
**Mineral Waters.** Those from springs containing mineral salts in solution. Much now sold is prepared artificially. If properly prepared it should have just the same properties as the natural waters. See SPRINGS.

**Mineral Wax.** Natural hydrocarbon of the paraffin series, resembling wax in consistency, though occurring in several different colors; ozocerite.

**Mineral Wool.** See SILICATE COTTON.

**Miner's Inch.** Arbitrary unit of measure employed chiefly in Cal. to determine the amount of water used in hydraulic mining. In general terms, an inch of water is the quantity that will flow from a flume through each sq. in. of a rectangular outlet in a plank from one to three inches in thickness, when the surface of the water in the flume is kept at a constant height, usually 6 to 9 inches, above the central line of the opening. The amount of water discharged in a given time varies with the head, the size and shape of the opening, and the thickness of the plank. The average effective discharge for each inch may be taken as from 90 to 95 cubic feet an hour. In different States and Territories its value ranges from 1.2 to 1.8 cubic feet per minute.

**Minerva.** Roman goddess of wisdom, and patroness of arts and trades; guide amid the perils of war, and helper on to victory; represented as wearing helmet, shield and coat of mail. See ATHENA.



Temple of Minerva in the Forum of Nerva.

**Minerva Press.** Printing-office in London from which issued highly sentimental novels during the end of the 18th and beginning of the 19th century.

**Mines,** MILITARY. Underground chambers or excavations charged with gunpowder or other explosive intended to produce a destructive effect at a particular time. In siege operations, when all methods of sapping fail to advance the approaches, the only recourse is to advance by underground galleries. At their extremities mine chambers of sufficient capacity are located to blow up the enemy's works; in the resulting confusion the position is assaulted and carried, as was the case with the Petersburg, Va., mine 1864. To intercept and destroy the besieger's mines, the besieged establish countermines, whose galleries run out from the ditches of their works. When the volume of earth to be blown out is such that the radius of the crater is equal to the depth of the center of the charge, the mine is a common one: under- and overcharged mines under the same conditions would require less and greater charges respectively than the common mine.

**Mine Surveying.** This differs from similar work in other branches of industry chiefly in the special devices adopted to overcome special difficulties arising from the narrowness of the passages in which the work has to be done, and from the lack of diffused light.

**Mine Timbering.** This includes the complex of operations in mines, in which wood is employed in supporting masses of rock, or in the maintenance of passageways. In many cases this is accomplished by simple props, or by sets of sills, legs, and caps; in others the timbers are massed in batteries or built in complicated framework.

**Mine Ventilation.** Operations incident to supplying fresh air, and removing vitiated air in mines. In metal mines, especially when open to the surface at different levels, the natural current caused by the difference in temperature between the outer and inner air is usually sufficient for the purpose. In coal mines and others, in which dangerous gases are met, resort is had to artificial ventilation, whereby a current of fresh air is made to traverse the workings, either by increasing mechanically the pressure in the downcast shaft, or by reducing the pressure in the upcast, the reduction being brought about either mechanically or by the aid of a furnace placed at or near the bottom of the upcast.

**Ming.** Chinese dynasty, founded 1368 by Choo-Yuen-Chang, son of a laborer, leader of rebellion against Shun-te, last of the Yuen, a Mongol dynasty. The last monarch of the Mings was Tsung-Ching, d. 1642. See MANCHU INVASION.

**Minghetti,** MARCO, 1818–1886. Italian author, journalist, statesman, and financier; cabinet minister 1859–76, Premier 1863–65 and 1873–76. *Economia Publica*, 1859; *Opusculi*, 1872; *La Chiesa e lo Stato*, 1878; *Miei Ricordi*, 1888.

**Mingrelia.** Region e. of Black Sea, adjoining Georgia; anciently Colchis; held by Russia since 1804, but formerly an independent principality of Caucasus. The Mingrelians, who are a branch of the Georgians, number ab. 215,000. Area ab. 2,370 sq. m.

Mingrelian Types and Costumes.

**Minho.** River of n. w. Spain, forming part of the n. boundary of Portugal. Length 175 m., drainage area 157,000 sq. m.

**Minié,** CLAUDE ÉTIENNE, 1814–1879. French officer, inventor of the Minié rifle 1849; General and instructor in Egypt 1858.

**Minié Ball.** Elongated bullet, cast hollow for nearly two-thirds of its length and having a cup-shaped piece of iron inserted into the base of the opening. This forces the lead to take the grooves of the rifle when the bullet is fired. It was designed for the Minié rifled musket, introduced in the British service 1851, used in the Crimea, and superseded by the Enfield rifle 1853.

**Minims.** R. C. order founded in s. Italy 1436 as Hermits of St. Francis, thus named by the Pope 1493. Its rule was highly ascetic. Once numerous, it has now few houses.

**Minimum Deviation.** Smallest angular deflection which can be produced on a beam of radiation by an optical prism. The condition is that the angle of emergence from the prism shall equal the angle of incidence at the first face. Under this condition most optical experiments with prisms are conducted.

**Minimum Thermometer.** Automatic device of peculiar construction for registering the lowest temperature reached in any given time. A simple form is placed horizontally, and contains alcohol and an index which recedes with the alcohol and remains at the lowest point reached.

**Mining.** Complex of operations involved in working a

mine; art of attacking, excavating, and bringing to the surface masses of subterranean mineral matter, including the auxiliary processes of supporting walls, securing ventilation, removing water, and providing for incidental contingencies. Many comprehensive treatises on mining have been written in German and French, especially by Lottner, Serlo, Köhler, Leo, Combes, Ponson, Burat, Haton de la Goupillière, and Callon. Of the more recent English treatises those of André on *Coal Mining and Machinery*, Foster's *Ore and Stone Mining*, and Hughes' *Coal Mining* are among the most complete. Drinker's *Tunneling* contains much matter of value. Outside of such special works as these, an extensive mining literature is found in periodicals, technical journals, and the Transactions of societies like the American and North of England Institutes of Mining Engineers.

**Mining Law.** Under the influence of two opposite theories of ownership in mines, (1) that mineral deposits (especially gold and silver) belonged to the sovereign and could only be worked under grant or concession from him, and (2) that the original discoverer of a deposit had rights as against all others (the principle of mining freedom), there have developed in different countries codes and regulations forming a body of mining law, standing in many respects apart from the body of common or of statute law. A brief history of these is in R. W. Raymonds' Report for 1869 as U. S. Commissioner of Mineral Statistics. An American edition of Bainbridge's *Law of Mines and Minerals* was pub. 1871. The chief mining legislation of the U. S. dates from 1866, and rests largely on the local usages that grew up in the mining camps of the Pacific States and in the Rocky Mountain region after the discovery of gold in Cal. 1848. Copp's *U. S. Mineral Lands* may be referred to.

**Ministerium.** Lutheran association of ministers, having sole power to ordain, and appellate authority in doctrinal appeals.

**Ministers.** 1. Of state, forming the cabinet under any civilized government. 2. Ambassadors to foreign courts. 3. Of the gospel, ordained or licensed according to the usages of any Christian denomination.

**Minium,** or RED LEAD. $Pb_3O_4$. Red powder, varying in color and composition slightly; occurring occasionally as a natural mineral; made by heating lead oxide in the air; used as a pigment, in the manufacture of glass, etc. Treated with nitric acid, it yields lead nitrate and lead dioxide.

**Minks.** Genus *Putorius*, sub-genus *Lutreola*, of family *Mustelidæ*; digitigrade *Arctoidea*, valued for their fur in proportion to its depth of color. They are larger and stouter than weasels, the tail bushier, and the toes half-webbed. They emit a strong odor for defense. The American mink,

Minks (*P. lutreola*).

*P. vison*, is 15 to 20 in. long, the tail 8 to 10. It lives largely on fish, mollusks and crustaceans, can be tamed to a degree, and makes a good ratter. It ruts in Feb. and brings forth 5 or 6 hairless young in April in hollow log.

**Minneapolis.** Capital of Hennepin co., Minn., largest city of the State; on both sides of the Mississippi, at the Falls of St. Anthony; founded 1849, chartered 1867; seat of the State university. It is supplied with water by the Holly system; is an important railroad center, and has large manufactures of flour (ab. 10,000,000 bbls. annually) and lumber. Pop., 1890, 164,738.

**Minnehaha.** Waterfall 60 ft. in height on small river of the same name in Minn.; mentioned by Longfellow in *The Song of Hiawatha*.

**Minnesingers.** German lyrical poets, ab. 1170–1300, corresponding with the French and Provençal Trouvères. The

Minnesingers.—Manuscript of the Fourteenth Cent.

most eminent were WALTHER VON DER VOGELWEIDE and WOLFRAM VON ESCHENBACH (q.v.).

**Minnesota.** One of the northern central States. Its area is 84,286 sq. m. The surface presents little relief. The n. part is lacustrine and covered with dense forests, the s. largely prairie. The principal rivers are the Red, on the w. boundary, the M., and the Missisippi, which forms part of the e. boundary. The geological structure is simple. Running diagonally across the State n.e. and s.w. is an area of Archæan formations, and bordering it upon the s.e. are Cambrian rocks. The s.e. portion is mainly Silurian, while the n.w. quarter, including a large part of the lacustrine region and the valley of Red River, is Quarternary, having been formerly part of the ancient lake Agassiz. The agricultural interests are very large, consisting mainly of the culture of the cereals. The value of farms, 1890, was $340,059,470, and of farm products, 1889, $71,238,230. About 1,000,000,000 ft. of pine lumber was cut in 1892. The State has considerable mineral wealth, as yet imperfectly developed. It has a large and rapidly increasing railroad system. The earliest accounts of the native tribes and natural features appear in the writings of the Jesuits. For a century the territory was visited only for fur-trading purposes, except by a few missionaries. The first extensive exploration of the territory was made 1817–23 by Major S. H. Long of the U. S. Engineer corps. In 1849 M. was organized as a Territory, the w. boundary being fixed at the Missouri. A constitution was adopted 1857, and in 1858 the Territory was admitted as a State. The population was then little more than 150,000. During the Civil War the State supplied to the Union army more than 25,000 men, ab. a seventh of its entire population. Its recent growth, especially in its principal cities, Minneapolis and St. Paul, has been enormous. The Sioux War occurred 1862–63. Capital, St. Paul. Pop., 1890, 1,301,826. (See Map, p. 74.)

**Minnesota River.** Branch of the Mississippi, heading in Big Storm Lake, flowing s.e. and then n.e. to its mouth, near Minneapolis. Length 300 m., drainage area 17,230 sq. m., mean flow 7,600 cub. ft. per second.

**Minnesota,** UNIVERSITY OF. Founded at Minneapolis 1851; reorganized 1869–70 as State Univ.; co-educational; endowed with over 200,000 acres, since largely sold. It has departments of science and arts, engineering, agriculture, law, medicine, dentistry, and pharmacy (1896), 144 instructors, 2,400 students and 40,000 vols. Free in all but professional departments.

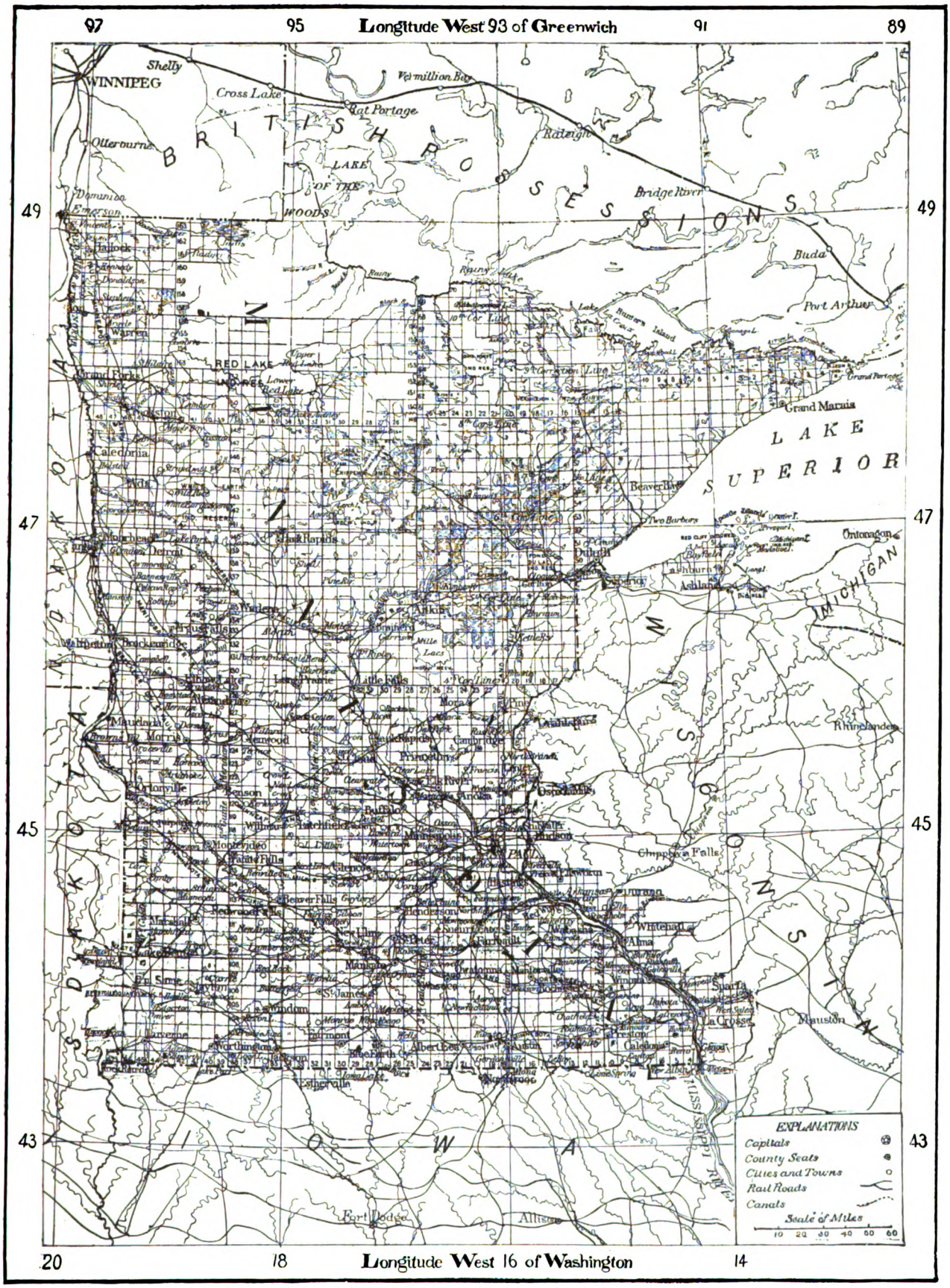
**Minnewaukon** (or DEVIL'S) **Lake.** Saline lake in N. Dakota, with no outlet, 40 m. by 12 m., 1,460 ft. above the sea.

**Minnow.** See EVENTOGNATHI and HAPLOMI.

**Mino da Fiesole,** ab. 1430–1486. Italian architect and sculptor.

**Minor.** Determinant remaining after deleting (striking out) any row or rows and the same number of columns. The principal minor is that when but one row and one column is deleted; the element common to the row or column deleted is the cofactor. A complementary minor is the determinant formed of the elements common to the deleted rows and columns.

**Minor Axis** OF THE ELLIPSE. Conjugate axis. Half of the minor axis is used as a constant in the rectangular equa-


97
95
Longitude West 93 of Greenwich
91
89
49
47
45
43
20
18
Longitude West 16 of Washington
14
WINNIPEG
Shelly
Cross Lake
Rat Portage
Vermillion Bay
Ottertourne
BRITISH POSSESSIONS
LAKE OF THE WOODS
Raleigh
Bridge River
Buda
Port Arthur
Emerson
Grand Marais
LAKE SUPERIOR
Caledonia
Duluth
Superior
Ashland
Ontonagon
MICHIGAN
Rhinelander
Little Falls
Brainerd
Aitkin
Crookston
Moorhead
Detroit
Fergus Falls
Wahpeton
Brecksville
Alexandria
Morris
Ortonville
Benson
Hutchinson
Minneapolis
ST. PAUL
Hastings
Red Wing
Chippewa Falls
Hopkins
Mankato
Fairmont
Albert Lea
Austin
Winona
La Crosse
Sparta
Mauston
Whitehall
Alma
Preston
Caledonia
Worthington
Jackson
Esthervillo
Fort Dodge
Allison
MINNESOTA
NORTH DAKOTA
SOUTH DAKOTA
WISCONSIN
IOWA
MISSISSIPPI RIVER
EXPLANATIONS
Capitals
County Seats
Cities and Towns
Rail Roads
Canals
Scale of Miles
10 20 30 40 50 60

tion, and is determined from the primary constants by the equation $b^2=a^2-c^2$.

**Minorca.** One of the Balearic Isles, 25 m. n.e. of Majorca. It has some mineral resources. Area 300 sq. m.; pop. ab. 34,000.

**Minorites.** First name of the FRANCISCANS (q.v.).

**Minor Key,** or MODE. In Music, that which employs a scale in which the first semitone falls between the second and third tones ascending.

**Minor Orders.** In R. C. Ch., four lower orders of the ministry, Ostiarius, Lector, Exorcist, and Acolyte, the last being highest. These do not oblige to celibacy or to a clerical life, and, with the Subdiaconate, may be given by a presbyter.

**Minos.** 1. King and lawgiver of Crete, at death made supreme judge in the lower world. 2. His grandson, husband of Pasiphæ and father of Ariadne and Phædra. He exacted annually of the Athenians a tribute of 7 youths and 7 maidens, to be devoured by the Minotaur in the Labyrinth.

**Minot,** GEORGE, 1817–1856. Lawyer of Boston. *Decisions of Mass. Supreme Court*, 1844.

**Minotaur.** Monster, half man and half bull, kept in a labyrinth built by Dædalus; offspring of Pasiphae; slain by Theseus with the aid of Ariadne, Minos' daughter.

**Minsk.** Old town of w. Russia, 331 m. n.e. of Warsaw, capital of a government. Pop. ab. 70,000.

**Minster.** Large church, seat of an ecclesiastical corporation, as a cathedral or abbey-church.

**Minstrels.** Wandering singers of the Middle Ages. In our time, renderers of negro melodies.

**Mint.** Establishment for making coins. In England coins were made for the crown by moneyers in London, with subordinate mints elsewhere. Barons, bishops, and the larger monasteries also had mints. The die was impressed upon the blank by a hammer; the screw press was invented 1553, and the lever press was introduced in England 1882. A new mint was built near the Tower 1810. In 1851 the moneyers were abolished and the mint placed in charge of the Chancellor of the Exchequer. Mints were also established at Sydney 1853, and Melbourne 1869. U. S. mints were opened at Philadelphia 1793, New Orleans 1835, San Francisco 1854, and Carson City 1870, the latter now suspended. The alloys of metals are rolled to strips, annealed, and drawn to uniform thickness; from these, blanks of the proper size are forced by the cutting press and filed to the right weight; these are then milled on the edges, annealed, cleansed from oxides by sulphuric acid, and stamped with the inscriptions in the lever coining press. The gold coins of the U. S. weigh 25.8 grains to the dollar, and the silver dollar 412.5 grains, both $\frac{9}{10}$ fine; the half-dollar weighs 192.9 grains, and the smaller coins proportionally. See ASSAY, COINAGE, and NUMISMATICS.

**Mint.** Herbs of the genus *Mentha*, natural family *Labiatæ*, of wide geographical distribution. Spearmint (*M. viridis*) and Peppermint (*M. piperita*) are grown for their volatile oil as

Spearmint. Peppermint.

farm crops in a few localities. The propagation is exclusively by root stocks, and it is essential that the culture be very clean, especially of any weeds containing acrid juices, otherwise it is much the same as for corn or potatoes. When the crop is mature it is cut and, after being slightly wilted, taken to the still, where the oil is driven off by steam and condensed over cold water. Wayne co., N.Y., is the chief seat of this industry in the U. S.

**Mint,** MOUNTAIN. Odorous herbs of the genus *Kœllia*, of the Mint family, natives of N. America; known as Basil.

**Minto,** SIR GILBERT ELLIOTT, 1751–1814. M.P. 1776; made Baron 1797 and Earl 1814; Gov.-gen. of India 1806–13.

**Minto,** WILLIAM, 1845–1893. Prof. at Aberdeen from 1880. *English Prose Writers*, 1872; *English Poets*, 1874; *Defoe*, 1879; *Crack of Doom*, 1886; *Literature of Georgian Era*, 1894.

**Minucius,** FELIX. Christian apologist, probably of 2d century; author of a Latin dialogue, *Octavius*.

**Minuend.** Quantity from which another is subtracted.

**Minuet.** Slow and graceful dance of French origin, to music of $\frac{3}{4}$ time.

**Minuit,** or **Minnewit,** PETER, ab. 1580–1641. Dutch gov. of New Netherlands 1626–31; founder of the Swedish colony in Del. 1638.

**Minus.** Algebraic sign of operation (—) indicating subtraction, and of character opposite to plus (+). Quantities having the minus sign are called negative.

**Minute Men.** Militia of the colonies, especially Mass., organized for military drill, that they might be ready for action at a moment's warning, as at Lexington and Concord.

**Minyas.** Founder and king of Orchomenos, Bœotia; ancestor of some of the Argonauts. His daughters were turned into bats for offending Dionysus.

**Miocene.** Middle Tertiary beds; so called by Lyell.

**Miohippus.** See EQUIDÆ.

**Miquel,** FRIEDRICH ANTON WILHELM, 1811–1871. Prof. of Botany at Utrecht 1859. *De organorum in vegetabilitus ortu et metamorphosi*, 1833; *Genera Cactearum*, 1839; *Monographia Cycadearum*, 1842; *Flora Indiæ Batavæ*, 1855–59; *Sumatra, seine Pflanzenwelt und deren Erzeugnisse*, 1862; *Prolusio Floræ Japonica*, 1865–67.

**Miquel,** JOHANN, b. 1829. Burgomaster of Osnabrück 1865–70, 1876–80, and of Frankfort 1880; prominent in n. German politics; Finance Minister of Prussia 1890.

**Miquelon Islands.** Off the s. coast of Newfoundland, forming with islands of St. Pierre a colony belonging to France with an area of 81 sq. m. Fishing is the sole occupation. Pop. 5,765.

**Mira,** or OMICRON CETI. Variable star; right ascension 2h. 13m., declination 3° 35′ S. The variability was discovered by Fabricius 1596. Usually it is a 12th magnitude star, but at intervals of 11 months it increases in brightness, sometimes reaching the 2d magnitude. After a few days it again diminishes, occupying about 100 days in the rise and fall.

**Mirabeau,** HONORÉ GABRIEL RIQUETTI, COMTE DE, 1749–1791. Leader in the French Revolution. After an irregular semi-literary life he entered the third estate of the States

Honoré Gabriel Riquetti Mirabeau.

General 1788, and ruled the Assembly by his eloquence. Alarmed at the rapid pace of events, he vainly endeavored to save the throne.

**Mirabeau,** VICTOR RIQUETTI, MARQUIS DE, 1715–1789. French political economist, father of the statesman; advocate of physiocratic theories; ed. *Ami des Hommes*, 1755; *Theorie de l'Impot*, 1760; *La Philosophie Rurale*, 1763; *Journal de l'Agriculture, du Commerce, et des Finances*, 1763–74.

**Mirabilite.** See GLAUBER'S SALT.

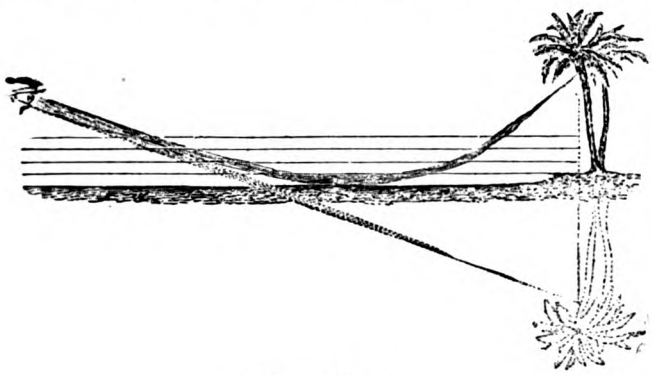
**Miracle.** In Scripture, some extraordinary act, usually of beneficence, so far transcending the usual course of nature as to make a special impression of divine presence.

**Miracle Plays.** Dramatized legends of the saints, popular on the Continent ab.1150–1550. In England MYSTERIES (q.v.) bore this name. See also MORALITIES.

**Mira de Mescua,** 1570–1635. Spanish dramatist and poet, drawn upon by Calderon and Corneille.

**Miraflores,** MANUEL DE PANDO, MARQUIS, 1792–1872. Spanish statesman and historian. *Isabella II.*, 1843; *Memoirs.*

**Mirage.** Optical illusion, due either to aerial refraction of light, to its total reflection, or to a combination of both. The different phenomena may be classed as (1) mirage of the desert; (2) sea; (3) looming; (4) FATA MORGANA (q.v.). In the first, inverted images of distant objects are seen below the level of the ground. At sea the images are still inverted, but above the surface. Looming is due to refraction alone; the image is above the object and erect. Sometimes a combination of (2) and (3) occur, when two images are seen.



Theory of Mirage.

**Miramichi.** River of New Brunswick, flowing e. and n.e. to the Gulf of St. Lawrence. Length 220 m.

**Miramon,** MIGUEL, 1832–1867. Mexican general and revolutionist, in exile 1860–62; executed with Maximilian.

**Miranda,** FRANCESCO DI, 1495–1558. Portuguese poet.

**Miranda,** FRANCESCO ANTONIO GABRIEL, 1756–1816. Venezuelan soldier, who attempted to liberate his country 1806, fought with Bolivar 1810–12, and was taken a prisoner to Spain.

**Mirandola,** GIOVANNI PICO DELLA, 1463–1494. Italian philosopher and theologian. *Being and Unity.*—His nephew, FRANCESCO, 1469–1533, wrote similar books.

**Mirat.** See MEERUT.

**Mirbane,** OIL OF. See NITROBENZENE.

**Mirbel,** CHARLES FRANÇOIS, 1776–1854. French botanist. *De l'influence de l'histoire naturelle sur la civilisation*, 1801; *Histoire naturelle des plantes*, 1800–6; *Physiologie végétale et de botanique*, 1815; *Végétaux phanérogames de l'ancien monde*, 1827.

**Mirdites.** Christian tribe in Upper Albania occupying a tract ab. 40 m. square nearly surrounded by the Drin. They never intermarry, giving their daughters to other Christian tribes, and capture their wives from the Mussulmans. They number ab. 20,000.

**Miriam.** Prophetess of Israel, elder sister of Moses.

**Mirkhond** (MOHAMMED BIN KHAWAND-SHAH BIN MAHMUD), 1433–1498. Persian author of a universal history, tr. 1832.

**Mirror.** Smooth surface from which rays of light may be reflected so as to form a virtual image according to regular and fixed laws. Its surface is invisible, other surfaces being made visible by the irregular reflection which takes place. The best mirrors are made of polished silver, and are either plane or curved. Curved mirrors are usually either spherical or parabolic: great accuracy in the construction of the latter is difficult. Ordinary mirrors are a plate of glass backed by an amalgam of tin and mercury. Mirrors of brass were used by the Hebrews; of bronze by the ancient Egyptians, Greeks, and Romans; of silver by the Greeks 328 B.C.; of glass by the Venetians 1300, introduced into England 1673. Silvered glass reflects 91 per cent of light from the silver side, 78 per cent from the glass side; ordinary mirrors, tin amalgam, reflect 44.6 per cent. See MAGIC MIRRORS.

**Mirza.** Persian title, meaning prince when placed after the name, and mere courtesy before it.

**Mirzapur.** Town of India, on the Ganges, 45 m. s.w. of Benares. It has a large trade and some manufactures. Pop., 1891, 84,130.

**Miscarriage.** Term applied to the expulsion of the fœtus between the fourth and seventh month. See ABORTION and PREMATURE DELIVERY.

**Miscibility.** Property of fluids which, when mixed, dissolve each other, and there results a mass homogeneous throughout. In many cases there is a limit of miscibility beyond which a layer of separation forms and the denser fluid is found at the bottom.

**Misdemeanor.** Any crime below a felony at common law; defined and punished by modern statutes.

**Miserere.** Setting of the 50th Psalm (Vulgate), used in the office of the *Tenebræ* in Holy Week. The most celebrated settings are those used in the Sistine Chapel by Allegri, Bai, and Baini.

**Mishme Bitters.** Tonic made from the root of *Coptis teeta*, the Golden Thread of Assam.

**Mishna.** First part of the Talmud; including traditions and expositions of O. T. texts, in 6 books and 63 treatises; supposed to have been delivered to Moses and orally preserved till written down ab. 150.

**Mispickel.** See ARSENOPYRITE.

**Misrepresentation.** Untruth which materially injures another by inducing him to contract. At law, if fraudulent, and in equity sometimes when innocent, it gives the injured party the right to avoid the contract.

**Missa Fidelium.** In the ancient Church, Eucharistic service, to which only the baptized were admitted.

**Missal.** R. C. office-book for the mass, framed ab. 1546 on the basis of ancient liturgies.

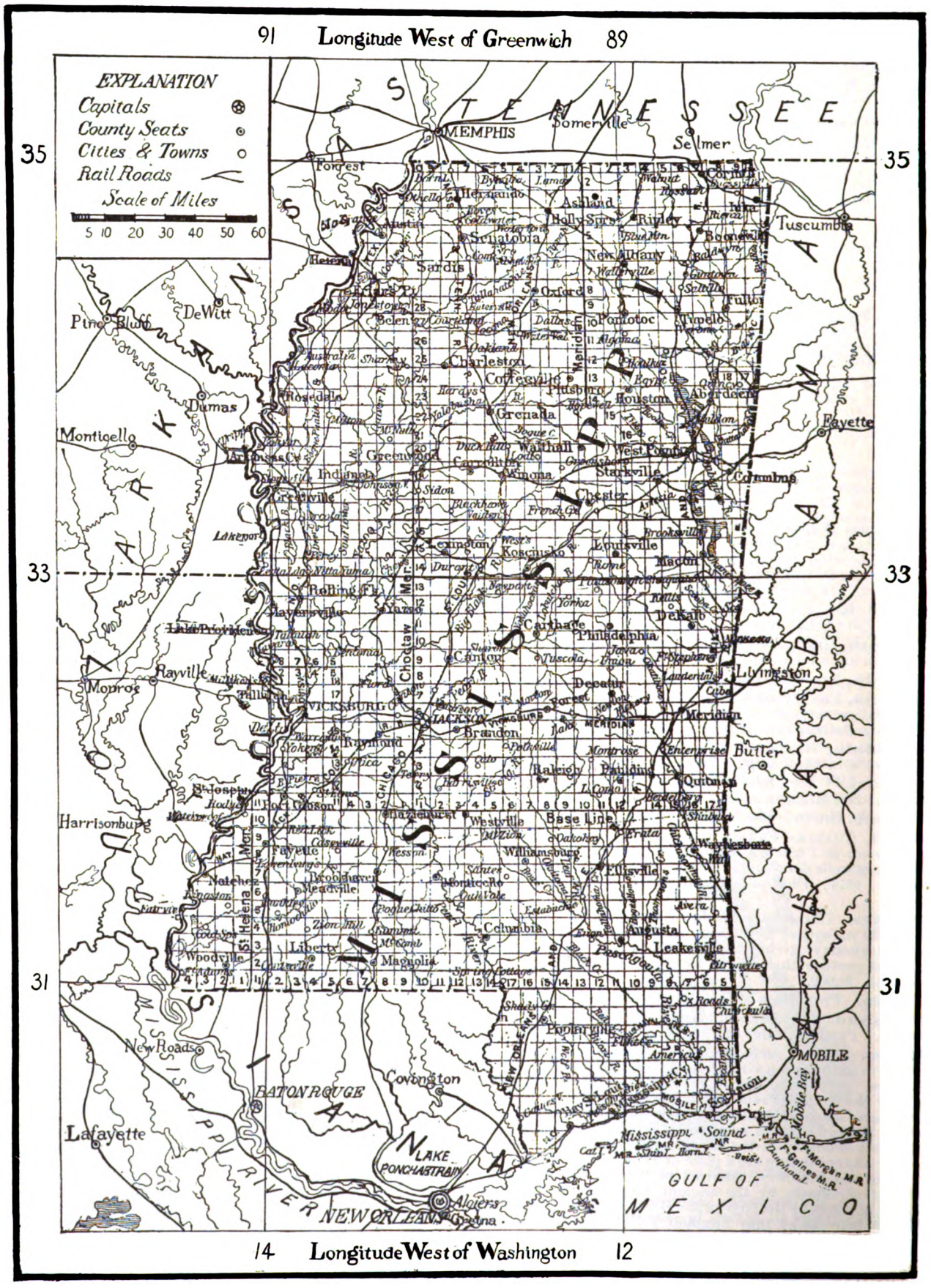
**Missing Stars.** It is frequently asserted that a number of stars have disappeared from the heavens within one or two centuries. In almost every such case it has been found that the supposed disappearance was due to mistakes in the old catalogue.

**Missionary Ridge,** BATTLE OF. See LOOKOUT MOUNTAIN.

**Missions.** The early Ch. was essentially a missionary enterprise, and this activity continued until all Europe, with much of Asia and Africa, was nominally Christian. It was resumed and organized in the R. C. Ch. early in 16th century, when much was attempted in America, India, and Japan. England made some provision for her colonies, chiefly through the S. P. C. K., founded 1698, and the S. P. G., 1701. Denmark sent Egede to Greenland, and the Moravians from 1732 set an example to Christendom. With these exceptions, Protestant foreign missions were begun 1792 under great opposition at home. Within the last 80 years they have developed rapidly. At present large sums are spent upon them; nearly every communion in Europe and America is interested in them, and missionaries are working in every section of the earth.

**Mississippi.** One of the southeastern States. In shape it is rectangular. Its area is 46,810 sq. m. The surface is very level; the greatest elevation, near the n.e. part, is scarcely 500 ft. above sea level, while considerable areas are less than 100 ft. Except a strip along the Gulf coast and the Yazoo bottoms near the Mississippi, it consists of upland, heavily forested, except where cut away. Its only navigable river is the M., along the w. border, and to a small extent the Yazoo. Its geological structure is simple, the oldest formation being the Cretaceous, which occupies an area in the n.e. part. W. and s. of it are Eocene beds, followed still further s. by Neocene. The Yazoo bottoms and the low coast country are of Quarternary deposits. The primary industry is the raising of cotton: in no other State is this carried on so exclusively or is the return better. The product in 1890 was 1,154,406 bales and in 1895 ab. 1,200,000. The value of the farms, implements and machinery in 1890 was $133,392,022 and the value of agricultural products $73,342,995. M. was a part of the territory originally claimed by La Salle for France. Between 1699 and 1763 several colonies were established under grants from France; most of these met with misfortunes and reverses, the Natchez Indians being among the afflicting elements. In 1763 France ceded to England all her possessions e. of the M. except the island of New Orleans, ceded to Spain. The province acquired by England was called e. and w. Florida, the w. portion including the s. half of the present State. In 1783 England ceded w. Florida to Spain, which afterward relinquished the M. portion to the U. S. The n. boundary was extended, and the Territory, with its present boundaries, admitted to the Union 1817. M. seceded 1861, and was the seat of some of the most important conflicts of the Civil War. It was prostrated by the results of the war, and has but recently begun to regain its prosperity. Pop., 1890, 1,289,600, more than half colored.

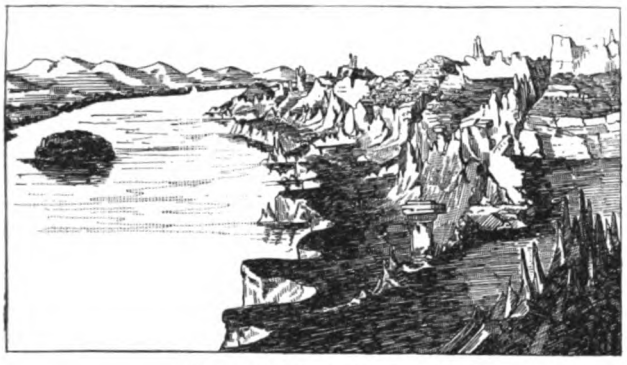
**Mississippi River.** Largest river of the U. S., and with


91 Longitude West of Greenwich 89
EXPLANATION
Capitals
County Seats
Cities & Towns
Rail Roads
Scale of Miles
5 10 20 30 40 50 60
35
33
31
14 Longitude West of Washington 12
TENNESSEE
ALABAMA
ARKANSAS
LOUISIANA
MISSISSIPPI
MEMPHIS
Somerville
Selmer
Corinth
Tuscumbia
Forest
Hernando
Ashland
Holly Springs
Ripley
Boonville
Senatobia
New Albany
Sardis
Oxford
Pontotoc
Tupelo
Fulton
Pine Bluff
DeWitt
Dumas
Charleston
Coffeeville
Pittsboro
Houston
Aberdeen
Rosedale
Grenada
Montgomery
Greenwood
Walthall
West Point
Fayette
Indianola
Carrollton
Winona
Starkville
Columbus
Greenville
Sidon
Chester
Lakeport
Lexington
Koscusko
Louisville
Brooksville
Macon
Rolling Fork
Yazoo
Rome
Yorka
Mayersville
Carthage
Philadelphia
Deksalb
Lake Providence
Tallulah
Canton
Tuscola
Rayville
Monroe
Vicksburg
Jackson
Decatur
Meridian
Livingston
Raymond
Brandon
Pelahatchie
Raleigh
Paulding
Quitman
Butler
Harrisonburg
St. Joseph
Port Gibson
Hazlehurst
Westville
Base Line
Fayette
Caseyville
Wesson
Williamsburg
Ellisville
Waynesboro
Natchez
Brookhaven
Meadville
Monticello
Quitman
Columbia
Augusta
Leakesville
Woodville
Liberty
Magnolia
Poplarville
New Roads
Covington
EATON ROUGE
Lafayette
LAKE PONCHARTRAIN
New Orleans
Algiers
Gretna
MOBILE
Mobile Bay
Mississippi Sound
GULF OF MEXICO
Choctaw
Meridian
St. Helena
Mississippi River

the Missouri branch the longest on the globe, 4,133 m. It drains nearly all the depression between the Appalachian and the Rocky Mountains, an area of 1,240,039 sq. m. Most of its basin consists of plains well watered and heavily wooded in the e. and semi-arid and sparsely grassed in the w., with a prairie region connecting the two. Its main branches are the Ohio from the e., the Missouri, Arkansas, and Red from the w. The length of the river and of its main tributaries, and their annual discharge, are as follows:

| | Length. | Drainage area. | Av. flow cu.ft. per sec. |
|---|---|---|---|
| Upper Mississippi | 1,265 | 1,240,039 | 105,000 |
| Lower " | 1,225 | | 675,000 |
| Ohio . . . . . | 1,204 | 201,720 | 158,000 |
| Missouri . . . . | 2,908 | 527,672 | 121,900 |
| Arkansas . . . | 2,170 | 185,671 | 63,000 |
| Red . . . . . | 1,200 | 89,970 | 57,000 |

The total extent of navigable water on the main stream and its tributaries is 15,000 m. The main river heads in Lake Itasca in n. Minn., at an elevation of 1,680 ft., and flows generally s. to the Gulf of Mexico. The Ohio heads in the Appalachian Mts. and flows s.w. to its mouth at Cairo, Ill. The Missouri heads in the n. Rocky Mts., flows e. and then s. to its mouth just above St. Louis. The Arkansas heads in the Rocky Mts. in Col. and flows e.s.e.; and the Red, heading in the same range in New



View of the Upper Mississippi.

Mexico, pursues a nearly parallel course to its mouth. The main river above the mouth of the Ohio and its branches have in general sufficient slope to transport detritus, which is in great part deposited along the lower river, raising its bed above the surrounding country, which is largely made up of this detritus. In this part of its course the river is very winding and unstable, continually shifting its position. Floods, frequently disastrous in extent, are of common occurrence on the river and its main branches. On the lower river they are seldom serious except when floods in two or more branches are coincident. Then they often overflow the levees, which line the river, and cover vast extents of neighboring country, which lies slightly lower than the river. The river empties through a delta, consisting of several outlets, known as passes, each of which is shallow and obstructed by bars, which formerly limited navigation. Within a few years the South Pass has been deepened by jetties, so that vessels of 30 ft. draft can easily and safely enter. See JETTY and LEVEES.

**Mississippi Scheme.** Project for paying off the national debt of France, started at Paris 1717 by JOHN LAW (q.v.) under patronage of the regent. The entire province of Louisiana was granted to "The West India Co.," of which Law was director-general. The collapse came 1720.

**Mississippi,** UNIVERSITY OF. Opened 1848 in Lafayette co. It has 12 teachers and ab. 175 students.

**Missolonghi.** See MESOLONGGI.

**Missouri.** One of the central States. Its area is 69,415 sq. m. The portion lying n. of the Missouri is mainly prairie, being level or undulating, with comparatively little timber. The s. portion is largely within the area of the Ozark hills, and is broken, without presenting any high degree of relief. The s.e. portion, bordering the Mississippi, is low and alluvial. The n. prairie portion and the w. part of the s. are overlaid by the Carboniferous formation. The Ozark hill region is Silurian, with an area in its e. part of Cambrian beds, in which is the celebrated mining district of Iron Mountain. The s. alluvial region is Quarternary. The industries of the State are agricultural, manufactures being confined to two or three cities. Wheat, Indian corn and tobacco are largely raised. The value of farms in 1890 was $625,858,361, and the product was valued at $109,751,024. M. has very valuable mineral resources. It produced, 1895, 2,383,322 tons of coal. When La Salle took possession of Louisiana 1682, what is now M. was included in it. St. Louis was settled ab. 1763, and other settlements were established, mostly on the banks of the Mississippi. When Louisiana was ceded to the U. S. 1803, the territory was divided into two portions. The upper portion was organized as a Territory 1812, and applied 1818 for admission as a State. Thereupon arose one of the bitterest controversies which has ever taken place in Congress, lasting two years. M. was admitted 1821 on the basis of the MISSOURI COMPROMISE (q.v.). During the Civil War it was kept in the Union with great difficulty, the governor having issued a proclamation declaring it out of the Union, but a State convention had just been called having sufficient Union men to prevent secession. Capital, Jefferson City; chief cities, St. Louis and Kansas City. Pop., 1890, 2,679,184.

**Missouri Compromise.** Proviso admitting Mo. to the Union as a slave-holding State, with the provision that slavery should thereafter be prohibited in States formed n. of parallel 36° 30′, and that in States s. of that line it should be left to State decision.

**Missouri Range.** Front range of the Rocky Mt. system in n. Montana. It separates the drainage of the Upper Missouri from that of Clark's Fork of the Columbia. Average height 10,000 ft.

**Missouri River.** Largest branch of the Mississippi. It heads in the mountains of s.w. Montana, in three forks, the Jefferson, Madison, and Gallatin, flows at first n., then e., and finally s.e. to its mouth just above St. Louis. Its principal branches are the Yellowstone, Cheyenne, Platte, and Kansas on the right, and the James and Big Sioux on the left. Its heads are in high mountains, its middle course is through arid plains, and its lower course in a fertile region. Its annual flood is in June. Length 2,908 m., drainage area 527,672 sq. m. It is navigable to Great Falls, Mon., at high stage of water. Average flow 121,900 cu. ft. per second.

**Missouri,** UNIVERSITY OF. At Columbia, Mo.; founded 1839. A normal course was added 1867, a college of agriculture and school of mines 1870 (the latter at Rolla), a school of law 1872, of medicine 1873, and of engineering 1877. It had (1895) 40 professors and 19 instructors, 16 graduate, 248 academic, and 380 professional students. It is the head of the State school system, and in all departments is open to women.

**Mist,** or FOG. Visible watery vapor sometimes hanging near the surface of the earth, caused by the precipitation of the moisture of the atmosphere. See LONDON FOG.

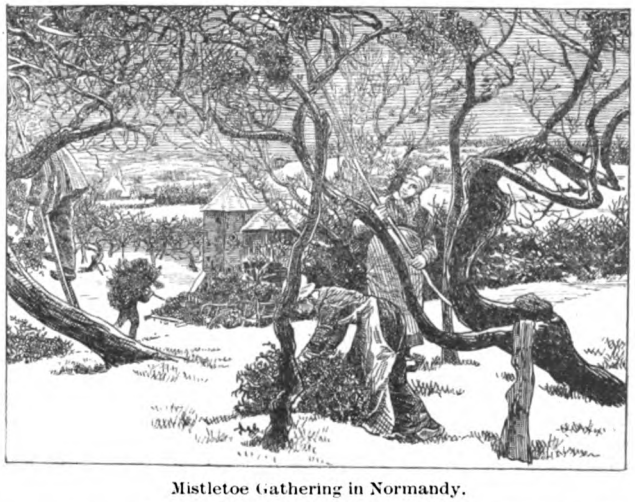
**Mistake.** 1. Of a material fact in doing an act or entering into a contract, entitles the one mistaken to relief in equity. 2. Of law, it does not have any relief as a rule.

**Mistassini.** Lake in Labrador, drained by Rupert River to Hudson's Bay; 100 m. long, 14 m. broad.

**Misteli,** FRANZ JOSEF, b. 1841. Prof. Basel 1874; writer on philology.

**Mist Flower.** *Eupatorium cœlestinum.* Purple-flowered herb of the Composite family, native of the s.e. U. S.

**Mistletoe.** *Viscum album.* Parasitic shrub of the Mistletoe family, native of Europe growing on various trees, notably on the apple. The mistletoe is connected with many of the



Mistletoe Gathering in Normandy.

superstitions of the ancient Germans and the British Druids; the latter styled it All Heal as being an antidote for all diseases. Traces of the ancient regard for the mistletoe still remain in some old English Christmas customs, as kissing under the mistletoe.

95
93
Longitude West 91 of Greenwich
89
EXPLANATIONS
Capitals
County Seats
Cities and Towns
Rail Roads
Canals
Scale of Miles
10 20 30 40 50 60
Hillsboro
Havana
Peoria
Decatur
Illinois R.
Kaskaskia
Ohio Riv.
Cairo
Paducah
Mt. Vernon
Salem
Powhatan
Huntsville
Independence
Emporia
Topeka
Atchison
Leavenworth
Kansas City
Lexington
Jefferson City
Hannibal
Quincy
Springfield
Cape Girardeau
Ste. Genevieve
Sikeston
Caruthersville
Bloomfield
Fredericktown
Ironton
Poplar Bluff
Doniphan
Neosho
Lamar
Carthage
Joplin
Pierce City
Mountain Grove
Ozark
Cassville
Bolivar
Marshfield
Springfield
Lebanon
Rolla
Salem
Potosi
Farmington

**Mistletoe,** AMERICAN. *Phoradendron flavescens.* Parasitic plant of the Mistletoe family, abundant in the s. U. S., growing on various trees; known as False Mistletoe.

**Mistral.** Cold, dry land wind of s. Europe, especially s. France and n. Italy, blowing in heavy gusts down upon the Mediterranean.

**Mistral,** FREDERIC, b. 1830. Provençal poet, one of the first Felibres, 1854. His *Mirèio*, 1859, tr. 1867, won great repute in France and elsewhere. *Calendon*, 1867; *Golden Islands*, 1876; a Provençal dictionary, 1878–86; *Nerta*, a novel, 1883; *Queen Joanna*, a tragedy, 1890; *The Rhone*, 1896.

**Mitchel,** JOHN, 1815–1875. Irish journalist, transported for treason 1848. He escaped, edited pro-slavery papers in New York and Richmond, returned to Ireland 1874, and was twice vainly elected to Parliament. *Jail Journal*, 1854; *Hist. Ireland*, 1868.

**Mitchel,** ORMSBY MCKNIGHT, LL.D., 1810–1862. Astronomer; graduate of West Point, where he taught mathematics till 1831; Prof. Cincinnati Coll. 1836–44; director of Cincinnati Observatory 1845, for which he procured a telescope of 11¼ in. aperture, then one of the largest extant, and where he made many observations and discoveries; director Dudley Observatory, Albany, 1859; Brig.-gen. U. S. Vols. 1861, Major-gen. 1862, serving with distinction in Tenn. and Ala. *Planetary and Stellar Worlds*, 1848; *Orbs of Heaven*, 1851; *Sun, Planets, and Comets*, 1860; *Astronomy of the Bible*, 1863.

**Mitchell,** MT. In N. C.; highest summit of the Appalachian mountain system, 6,707 ft. in altitude.

**Mitchell,** ALEXANDER, 1817–1887. Pres. Milwaukee and St. Paul R. R., and of other Western companies; M.C. from Wis. 1871–75.

**Mitchell,** ALEXANDER FERRIER, D.D., b. 1822. Prof. St. Andrews from 1848. *Westminster Assembly*, 1883.

**Mitchell,** DONALD GRANT (IK MARVEL), b. 1822. American essayist and novelist. *Reveries of a Bachelor*, 1850; *Dream Life*, 1851; *Edgewood*, 1863–64; *Dr. Johns*, 1866; *English Lands*, 1889.—His grandfather, STEPHEN MIX, LL.D., was U. S. Senator 1793–95, and Chief-justice of Conn. 1807.

**Mitchell,** EDWARD COPPÉE, LL.D., 1836–1887. Law Prof. Univ. Pa. from 1874. *Sale of Lands*, 1877.—His grandfather, DAVID BRADIE, 1766–1837, was Gov. of Ga. 1809–13 and 1815–17.

**Mitchell,** ELISHA, D.D., 1793–1857. Prof. Univ. N. C. from 1825. *Geology*, 1842.

**Mitchell,** HINCKLEY GILBERT, D.D., b. 1846. Prof. Boston Univ. from 1884. *Hebrew Lessons*, 1884; *Pentateuch*, 1893.

**Mitchell,** JOHN, F.R.S., d. 1768. English botanist, long in Va.; adviser of Linnæus upon American flora. *Nova Plantarum Genera*, 1741.

**Mitchell,** JOHN HIPPLE, b. 1835. U. S. Senator from Oregon 1873–79 and 1885–97.

**Mitchell,** MARGARET JULIA, b. 1832. American actress, best known since 1862 as *Fanchon*. She became Mrs. H. Paddock 1868.

**Mitchell,** MARIA, LL.D., 1818–1889. Astronomer; discoverer of a comet 1847; first woman member of the Am. Acad. of Arts and Sciences; Prof. Vassar Coll. 1865–88.—Her brother, HENRY, b. 1830, is noted as a hydrographic engineer.—Her father, WILLIAM, 1791–1868. American astronomer, made observations for U. S. Coast Survey.

**Mitchell,** SAMUEL WEIR, M.D., LL.D., b. 1829. American poet, novelist, and authority on nervous diseases. *Wear and Tear*, 1871; *Nurse and Patient*, 1877; *Nervous System*, 1881; *In War Time*, 1884; *Roland Blake*, 1886; *Doctor and Patient*, 1888; *Characteristics*, 1893.—His father, JOHN KEARSLEY, M.D., 1798–1858, was prof. in Jefferson Medical Coll. from 1841. *Fevers*, 1849.

**Mitchell,** SIR THOMAS LIVINGSTONE, D.C.L., F.R.S., 1792–1855. Scottish officer; Surveyor-gen. of New S. Wales; explorer of interior Australia; knighted 1839. *Journal*, 1848.

**Mitchill,** SAMUEL LATHAM, M.D., 1764–1831. Prof. Columbia Coll. 1792–1801; M.C. 1801–4 and 1809–13; U. S. Senator 1804–9; Prof. Coll. Physicians and Surgeons 1808–26; Surgeon-gen. of N. Y. 1818; ed. N. Y. *Medical Repository*, 1797–1813. He conducted a mineralogical survey of N. Y. 1794–96, and pub. many scientific papers.

**Miter.** Cleft cap or turban, worn by R. C. bishops and some abbots.

**Mitered.** Molding turned at a right angle, or joint formed when two stones meeting at right angles are cut so as to make the junction diagonal, instead of one overlapping the other.

**Miter Gears.** See GEAR WHEELS.

**Miter Sill.** Lower sill, against which the gates of a canal lock abut when closed.

**Miter Wort,** FALSE. *Tiarella cordifolia.* Small herb of the Saxifrage family, native of n.e. N. America.

**Mites.** See ACARINA.

**Mitford,** MARY RUSSELL, 1786–1855. English poet, dramatist, and novelist. Her best work is *Our Village*, 5 vols., 1824–32. *Recollections*, 1852.

**Mitford,** WILLIAM, 1744–1827. M. P. 1783–1818. His *Hist. of Greece*, 5 vols., 1784–1818, is scholarly but strongly in the Tory interest.—His brother, JOHN FREEMAN, 1748–1830, was Lord Chancellor of Ireland 1802–6, and became Lord Redesdale.

**Mithra.** Subordinate Persian god of light, afterward identified with the sun, and adored as supreme; conceived as offering ever, both in and for each soul, a mystic sacrifice of redemption. His worship, accompanied by terrible rites, spread throughout the Roman empire, and lasted at Rome 68 B.C.–378.

Tetradrachmon of Mithradates VI.

**Mithradates VI.,** "THE GREAT," 136–63 B.C. King of Pontus from 120 B.C.; most formidable enemy of Rome, which he opposed in 3 wars between 86 and 66 B.C.; defeated by Sulla, Lucullus, and Pompey.

**Mitokinesis.** Indirect cell-division, including nearly all the more complicated forms of KARYOKINESIS (q.v.) in which a MITOM (q.v.) is formed.

**Mitom.** Chromatin filament of the cell nucleus which forms the KNAUEL (q.v.) during the resting stage of the cell.

**Mitosis.** See MITOKINESIS.

**Mitrailleuse.** Combination of musket barrels grouped around each other, designed to be loaded and fired at once;

Mitrailleuse.

superseded by the recent machine guns. The French used mitrailleuses in the Franco-Prussian war, but their service was much less efficient than was expected.

**Mitral Valve.** See VALVES.

**Mitre,** BARTOLOMÉ, 1821–1894. Pres. Argentine Republic 1862–68; historical writer and journalist. *Emancipation of S. America*, tr. 1892.

**Mitriform.** Miter-shaped organs, especially the calyptra of certain mosses.

**Mitscherlich,** EILHARD, 1794–1863. Prof. Berlin from 1822–63. *Lehrbuch der Chemie*, 1829–35.

**Mittelmark,** OF BRANDENBURG. Between the Elbe and Oder; Sclavonian conquest of Henry the Lion; colonized by Germans. The Margraviate was founded by Albert the Bear 1150; Berlin was founded by his sons, Otto and John. It passed 1320 to Louis of Bavaria, to Charles IV. of Bohemia 1365, and to the Count of Hohenzollern 1415.

**Mitylene.** See LESBOS.

**Mivart,** ST. GEORGE, F.R.S., b. 1827. English naturalist, prof. in R. C. London colleges 1862–84, and at Louvain 1890; opponent of natural selection. *Genesis of Species*, 1871; *Man and Apes*, 1873; *Contemporary Evolution*, 1875; *Lessons from Nature*, 1876; *The Cat*, 1881; *Nature and Thought*, 1883; *Origin of Reason*, 1889; *Canidæ*, 1890; *Types of Animal Life*, 1893.

**Mixed Ethers.** Ethers or organic oxides in which oxygen is joined to two different organic radicals, as $CH_3.O.C_2H_5$, methylethyl ether; made by treating the metallic derivative of an alcohol with the halogen substitution product of a hydrocarbon. See ETHERS.

**Mixed Marriages.** Those between Roman Catholics and Protestants; held sacramentally valid, but censurable, unless by special dispensation.

**Mixed Mathematics.** Application of mathematical principles to practical construction in the arts.

**Mizzen Mast.** Mast nearest the stern.

**Mnemonics.** Art of assisting the memory by artificial suggestion, usually with reference to detached facts and dates. The various systems in use depend on suggestive associations, such as rhymes, sentences, and combinations of numbers.

Restoration of the Moa.

**Mnemosyne.** Daughter of Uranus, and mother of the Muses by Zeus.

**Mnemotechnics.** See MNEMONICS.

**Mnevis.** Sacred bull, anciently worshiped at Heliopolis, Egypt.

**Moa** (DINORNIS). Gigantic bird of New Zealand, extinct ab.1770. Its skeleton has been found in vast numbers. Its legs were very thick; wings were absent. The largest females were nearly 15 ft. high. The eggs measured 10 by 7 inches, or nearly 2 ft. in circumference.

**Moab.** Tribe e. and s. of Dead Sea, descended from Lot. Their relations with Israel were sometimes friendly, but commonly hostile.

**Moabite Stone.** Pillar, inscribed in Phœnician characters by Mesha, King of Moab, with an account of his revolt, ab. 896 B.C., against Israel; almost oldest known monument

The Moabite Stone.

of Semitic speech in the world; discovered 1868 e. of Dead Sea; broken up by Bedouins, and imperfectly pieced together; now in the Louvre, Paris.

**Mo'allat.** Set of seven Arabic poems of the early period, said to have been written in gold upon cloth and suspended in the Ka'aba at Mecca.

**Moat.** Deep trench round a fortified place sometimes filled with water.

**Mobile.** City and seaport of M. co., Ala., on M. River, just above its mouth; settled by French 1702; held by Spain 1780–1813. It has a good harbor, with extensive commerce, ample railroad communications, and some manufactures. Farragut passed the forts in M. Bay, Aug. 5, 1864; they surrendered within the month. M. was besieged March 25, 1865. Fort Blakely was carried by assault April 9, and the city evacuated by Confederates April 12. Pop., 1890, 31,076.

**Mobile Equilibrium** (OF TEMPERATURE). See THEORY OF EXCHANGES.

**Mobile River.** In Ala., Miss., and Ga. It heads in two large branches, the Alabama and Tombigbee, which after generally s. courses unite 50 m. above the mouth, which is at the head of M. Bay. It is navigable to the junction of these branches. Drainage area 43,436 sq. m.

**Mobility.** That general property of matter in virtue of which a body is able to change its position in space with reference to other bodies. This is the conclusion also of Newton's second law of motion, that when a body, however massive, but free to move, is acted upon by a force however slight, some change of position takes place.

**Mobilization.** Act of passing from a state of peace to a preparation for war, by increasing the strength of the active army, calling out the reserves, accumulating supplies, munitions, and military stores. European nations, especially Germany and France, have given great attention to the rapid mobilization of their forces, and could bring a well equipped and very strong army upon their frontiers in a few weeks.

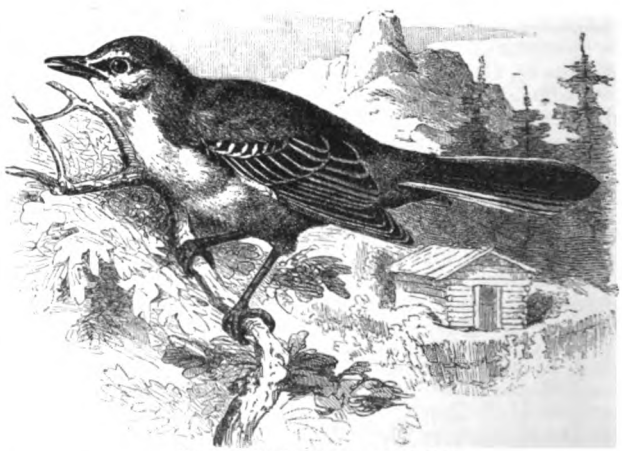
**Moccasin Flower.** Plants of the genus *Cypripedium*, showy-flowered herbs of the Orchid family, natives of the n. hemisphere.

**Moccasin Snake.** See ANCISTRODON.

**Mocha.** Town of s.w. Arabia, on the Red Sea; noted for its exportation of coffee. Pop. ab. 5,000.

**Mocha Stone.** See MOSS AGATE.

**Mocking Bird** (MIMUS). Graceful song bird of surpassing voice, with plain grayish-brown plumage, variegated with black


Mocking Bird (*Mimus polyglotta*).

and white. It winters in s. U. S. and summers as far n. as s. Wis. Length 9½ in., of which more than half is tail. The Cat bird, also a member of the Wren family, belongs to a closely related genus.

**Mock Money.** Ceremonial imitations of silver money and ingots, made of paper; burned by the Chinese as an offering to the spirits of the dead. Many kinds exist, the commonest consisting of sheets of brown paper, upon which tinfoil is pasted.

**Mock Orange.** See SYRINGA.

**Modeling.** See POTTERY and SCULPTURE.

**Modena.** Ancient city (Mutina) of n. Italy, 23 m. w. of Bologna; ruled by the Dukes of Este 1288–1859. Its univ., founded 1678, has ab. 35 instructors and 300 students. Pop. ab. 65,000.

**Moderator.** Presiding officer at assemblies of Presbyterian Ch.

**Modica.** Town of s.e. Sicily, 45 m. s.w. of Syracuse. Pop. ab. 38,500.

**Modillion.** Projecting and ornamented bracket, or console, supporting a cornice in classic or Renaissance architecture.

**Modjeska,** HELENA, b. 1844. Polish actress, well known in the U. S. since 1877, when her first appearance outside Poland was made in San Francisco.

**Modocs.** See TINNEH.

**Modoc War,** Nov. 1872–June 5, 1873. It arose from an attempt to compel a portion of the tribe to return to the Klamath reservation, Oregon, which they had left contrary to treaty. They maintained themselves in the lava beds till nearly all were captured. Capt. Jack, the leader, was executed Oct. 3, 1873, for the murder of Gen. Canby.

**Modulation.** In Music, art of regulated change from one tonality to another in the course of composition or performance.

**Module.** In Classic Architecture, measure of proportion in accordance with the scale of all the parts of an elevation or other design. The semi-diameter or diameter of the column at its base is the module commonly taken.

**Modulus.** When the stress developed in a solid is called out by longitudinal extension or compression, the ratio of this stress to the strain producing it is called longitudinal rigidity, and is represented by Young's modulus. Young defined it as the ratio of the simple stress required to produce a small shortening or elongation of a rod of unit section to the proportionate change of length produced.

**Modulus** (OF A GAS). Combination of the laws of Boyle and of Charles; expressed by the formula $p\,v=R\,T$, in which p and v are the pressure and volume of a given mass of gas at absolute temperature T. The coefficient R is a constant for any particular gas, and is called its modulus.

**Modulus of Elasticity.** See COEFFICIENT OF ELASTICITY.

**Modulus of Imaginaries,** or ABSOLUTE VALUE. The hypothenuse of a right triangle of which the reals in the normal imaginary are the sides$=\sqrt{a^2+b^2}$. It was devised for the interpretation of the imaginary symbol.

**Modulus of Rupture.** Ultimate longitudinal unit-stress of a material deduced from the formula for the flexure of beams. It lies between the ultimate tensile and compressive strengths of the material. If a beam of length l, breadth b, and depth d be laid on two supports and broken by a load W at the middle, the modulus of rupture is $R=3Wl\div 2bd^2$, which is expressed in pounds per sq. in. if W be in pounds and l, b, and d be in inches.

**Modulus of Superficial Tension.** See CAPILLARITY.

**Modulus of System of Logarithms.** See LOGARITHMS.

**Modulus of Transformation.** In transformation by linear substitution, determinant whose elements are the coefficient in the linear substitutes.

**Moe,** JORGEN ENGEBRETSEN, 1813–1882. Norwegian poet, Bp. of Christiansand 1875; associated with Asbjörnsen in compiling *Norse Folk-tales*, 1842–44, tr. 1859.

**Moebius,** AUGUSTUS FERDINAND, 1790–1868. Prof. Leipzig from 1816; contributor to Crelle's *Journal*. *Der Barycentrische Calcul*, 1827.

**Moench,** CONRAD, 1744–1805. Prof. Marburg. *Methodus plantas horti botanici et agri Marburgensis*, 1794; *Einleitung zur Pflanzenkunde*, 1798.

**Mœris,** LAKE. In the Egyptian FAYUM (q.v.). Extreme length 35 m. The investigations of Cope Whitehouse have given credence to the ancient accounts of the much larger dimensions of this originally artificial lake, which was connected with the Nile by a canal and used to regulate the inundation as a storage reservoir.

**Mœsia.** Roman province s. of the Danube; conquered 29 and 15 B.C.; invaded from ab. 250 by Goths, some of whom settled there 375 and later; occupied by Slavs ab.600, and made Bulgaria and Servia.

**Mœsogoths.** SEE GOTHS.

**Moffat,** ROBERT, D.D., 1795–1883. Scottish missionary in S. Africa 1816–70; father-in-law of Dr. Livingstone. *Labors and Scenes in S. Africa*, 1842.

**Mogeot,** JACQUES CLAUDE DE, b. 1808. Prof. Paris 1843. *Hist. French Literature*, 1857; *Foreign Literature*, 1880.

**Moghilev,** or MOHILOFF. 1. Town of Russia, on the Dnieper. Pop., 1891, 45,311. 2. Town on the Dniester. Pop. ab. 18,500.

**Mogok.** Town of Upper Burmah in a high valley 65 m. n.e. of Mandalay. It is the center of the ruby mining industry, but sapphires, topazes and other precious stones are also found.

Mogok.

The gems are found in the detritus from limestone rocks, an unusual matrix, judging from experience obtained elsewhere.

**Mogollon Mts.** S. escarpment of the Colorado plateau in e. Arizona.

**Mogul,** GREAT. Emperor of Delhi, as representative of the Mongols, called Moguls by the Persians. Baber, first Great Mogul, was great-grandson of Timur, founder of the empire 1526. The last lost his throne 1803.

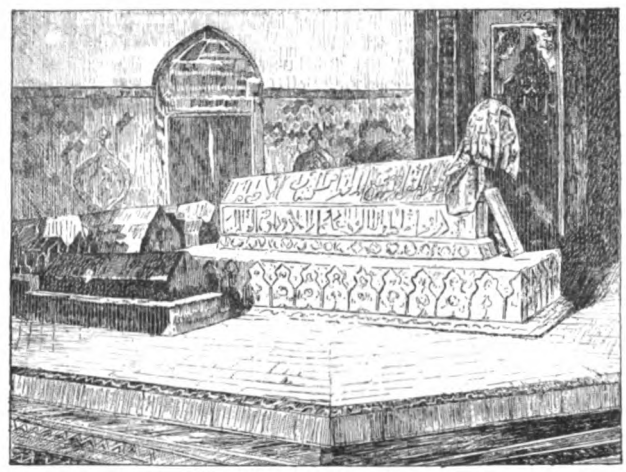
**Mogul Locomotive.** One with six driving wheels, used for ordinary freight service and on steep grades.

**Mohacs.** Town of s. Hungary, on the Danube; scene of a Turkish victory Aug. 29, 1526, when the Hungarian army was destroyed, and of a defeat of Turks by Charles of Lorraine Aug. 12, 1687. Pop., 1890, 14,468.

**Mohair.** Wool of Angora goat, and cloth made from it.

**Mohammed,** or MAHOMET, 570–632. Founder of Islam or Mohammedanism; b. at Mecca. He began to have visions 610; converted first his wife Kadijah and relatives; was expelled from his tribe, the Koreish; had to flee from Mecca to Medina (see HEGIRA), June 20, 622; defeated the Meccans 624; was defeated by them 625; after several expeditions found himself 631 at the head of an imperfectly organized empire. His revelations, he claimed, were made through the angel Gabriel (see KORAN); but the matter of them shows his indebtedness to Jewish tradition. He had 14 wives after Kadijah's death.

**Mohammed I.** Turkish sultan 1413–21.—II. 1430–1481; Sultan 1451; conqueror of Constantinople 1453, and of Servia, Bosnia, Morea and Trebizond 1458–61; defeated at Belgrade by Hunyadi 1456, at Rhodes by Knights of St. John. He won



Tomb of Mohammed II. in the Green Mosque at Brussa, Turkey.

many Greek islands from the Venetians and Genoese, and stormed Otranto 1480.—III. 1556–1603; Sultan 1595. He defeated a German and Hungarian army on plain of Keresztes Oct. 26, 1596.—IV. 1642–1692; Sultan 1648–87; defeated at Chotyn 1673, Vienna 1683, Mohacs 1687; deposed.

**Mohammedanism,** or ISLAM. Religion, numbering some 180,000,000 adherents, mostly Arabs, Moors, Turks, Persians, Hindoos, Malays, and Africans; founded by Mohammed in Arabia ab.622. It confines salvation to those who acknowledge one God and Mohammed as his Apostle. Jews and Christians are put to tribute; idolaters, where possible, to the sword. Orthodox Mohammedans, holding the Traditions, are called Sunnees; heterodox ones, principally Persians, are stigmatized as Sheahs or Sectaries. These deny Abu-bekr, Omar, and Ohman to have been true Caliphs, and honor Mohammed's son-in-law Ali, and Ali's murdered son Hosain, as almost divine. The Sunnees are divided into four great sects, identical in doctrine.

**Mohammedan Year.** See CALENDAR, MOHAMMEDAN.

**Mohammed Ghori,** d. 1206. Conqueror of n. India 1176–99.

**Moharram,** or MUHARREM. First month of the Mohammedan year. It is kept by the Shiite tribe as a month of fasting and mourning.

**Mohave Desert.** In s.e. Cal. and extending into Arizona. It is a basin with little water. M. river disappears here.

**Mohawk River.** Branch of the Hudson, draining the area between the Adirondacks and Catskills. Its mouth is at Troy. Length 145 m., drainage area 3,493 sq. m.

**Mohawks.** See FIVE NATIONS.

**Mohedano,** RAPHAEL, ab.1725–1795. Joint author, with his brother PEDRO RODRIGUEZ, ab.1730–1798, of a *History of Spanish Literature.*

**Mohicans,** or MOHEGANS. Algonquin Indians of w. Conn. and e. N. Y., offshoot of the Pequots of Mass.; now reduced to less than 500 persons, living near Lake Winnebago, Wis.

**Mohl,** HUGO VON, 1805–1872. Prof. and Director of the Botanical Gardens at Tübingen 1835. *Ueber den Bau der Porösen Gefässe der Dicotyledon*, 1832; *Anatomie und Physiologie der Gewächse*, 1834; *Vermischte Schriften botanischen Inhalts*, 1845; *Micrographie*, 1846; *Grundzüge der Anatomie und Physiologie der vegetabilischen Zelle*, 1851.—His brother, JULES, 1800–1876, prof. of Persian in Coll. of France from 1847, edited the *Shah Namah*, 1838–68. *Etudes Orientales*, 1879–80.

**Möhler,** JOHANN ADAM, 1796–1838. R. C. theologian; prof. Tubingen 1828, Munich 1835. His *Symbolik*, 1832, tr. 1843, caused much controversy. Some of his works were edited by Döllinger 1839–40, and his life was pub. 1894 by Prof. Friedrich, who sees in him a forerunner of the Old Catholic movement.

**Mohn,** HENRIK, b. 1835. Prof. Christiania 1866. *Atlas des Tempètes*, 1870; *Meteorologie*, 1875.

**Mohocks,** or MOHAWKS. Ruffians of the higher classes, who infested the streets of London 1711–12, and committed outrages on passers-by.

**Mohr,** KARL FRIEDRICH, 1806–1879. Prof. Bonn 1807. *Pharmaceutischen Technik*, 1847–66. Inventor of sp. gr. balance.

**Mohr's Specific Gravity Balance.** Instrument for the rapid determination of the specific gravity of liquids. It consists of a balanced horizontal beam, part of which is graduated in equal parts up to 10, beginning at the point of suspension. At the end is a hook, from which is suspended by a fine platinum wire a small float, which may be in the form of a thermometer, indicating any fixed temperature. Things are so adjusted that the beam is just balanced horizontally. Three riders of different weights, W, $\frac{1}{10}$W, and $\frac{1}{100}$W, may be placed at the different divisions on the beam. When the float is immersed in water, W must be placed at division 10 to restore the equilibrium. If now the specific gravity of a liquid lighter than water is to be determined, immerse in it the float and adjust the riders till equilibrium is restored; then, if W be at 8, $\frac{1}{10}$W at 2, and $\frac{1}{100}$W at 9, the specific gravity compared with water at the same temperature will be 0.829. If the liquid be heavier than water, a fourth rider equal to W must be placed at 10 to start with; then, if the others be at the same divisions as before, the specific gravity of the new liquid will be 1.829.

**Mohs,** FRIEDRICH, 1773–1839. Saxon mineralogist, prof. Gratz 1811, Freiberg 1817, and Vienna 1826. *Charakteristik der Klassen, Ordnungen, Geschlechter und Arten der Mineralien*, 1820; *Grundriss der Mineralogie*, 1822–24.

**Moidore.** Old Portuguese gold coin. Value ab. $7.

**Moir,** DAVID MACBETH, 1798–1851. Scottish poet. *Mansie Wauch*, 1828; *Hist. Medicine*, 1831.

**Mojos,** or MOXOS. Light-colored Indians in n. Bolivia on the Mamore, numbering ab. 30,000.

**Mokanna,** or HAKIM BEN ALLAH, d. 780. Veiled prophet of Khorassan, Persia; impostor, celebrated in Moore's *Lalla Rookh.*

**Moker Nut.** *Hicoria alba.* Forest tree of the hickory genus, native of the e. U. S., bearing a large nut with a thick husk and very fragrant foliage.

**Mokry,** OTOKAR, b. 1854. Bohemian poet and tale-writer.

**Molasses,** or TREACLE. Dark-colored thick syrup consisting of crystallizable and uncrystallizable sugar, water, coloring matter and the saline constituents of the juice of the sugar-cane, after crystallizing out all the sugar possible, as in the extraction of sugar on the plantations. Treacle from the sugar refinery is decolorized and, with addition of glucose in some cases, is sold as syrup.

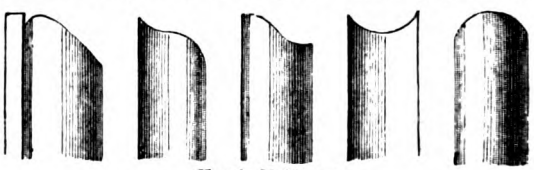
**Molay,** JACQUES BERNARD DE, d. 1314. Grandmaster of the Templars 1298; conqueror of Jerusalem 1299; driven from Cyprus to France by the Pope 1306; persecuted, with his order, by Philip the Fair, who coveted their wealth and was bent on their ruin; burned, after cruel tortures.

**Molbech,** CHRISTIAN, 1783–1857. Danish author, prof. Copenhagen.—His son, CHRISTIAN KNUD FREDERIK, 1821–1888, was a poet, novelist, and translator of Dante.

**Moldau.** Branch of the Elbe, flowing s.e. and then n. across Bohemia. Length 278 m.

**Moldavia.** N. part of Roumania; once a principality.

**Molding.** In Architecture, modeling of any surface, angle, or member, into projecting or receding profiles, either



Classic Moldings.

Various Moldings.

carved or straight-sided, or a combination of both. Each constituent part of the assemblage is called a molding, and the assemblage a group of moldings.

**Molding Machine.** 1. Wood-working machine for cutting out the profiles of ornamental moldings on long strips. Knives of the required profile are revolved at high speed, and the strips are fed against them by fluted feeding-rolls. The entire profile may be formed by the knives in one head, or part of the profile may be formed by one head and another part by another head when the shape is intricate. When the profile is to be cut on a curve, a piezing machine or shaper will be used. Molding machines are also called Stickers. 2. Machine for making the molds for casting in foundry work. Much of the labor and time of certain classes of work can be saved by appliances of this kind, but they cannot be profitably applied to all cases.

**Molé,** LOUIS MATTHIEU, COMTE, 1781–1855. French official, under Napoleon and Louis XVIII.; Premier 1836–39. *Essai de Morale et de Politique*, 1806.

**Molecular Refractive Energy.** Function $\frac{m(\mu-1)}{\delta}$, in which m is the molecular mass of a substance, $\delta$ its density, and $\mu$ its refractive index; constant for the same substance.

**Molecule.** In Chemistry, smallest portion of a compound capable of existence and retaining the characteristics of that compound. If this smallest particle were to be subdivided, the divisions would be the chemical atoms having characteristic properties of their own. The distance between the centers of contiguous molecules is estimated to be between $\frac{1}{250\,000\,000}$ and $\frac{1}{5\,000\,000\,000\,000}$. See ATOM and DIVISIBILITY.

**Mole-Rats.** See MYOMORPHA.

**Moles.** See TALPIDÆ and CHRYSOCHLORIDÆ.

**Moleschott,** JACOB, 1822–1893. Prof. of Physiology at Zurich 1856, Turin 1861, and Rome 1879, having taught at Heidelberg 1847–54; eminent as a materialist; ed. *Naturlehre des Menschen und der Thiere*, 1856–70. *Nahrungsmittel*, 1858–59; *Vom Leben*, 1867.

**Moleskin.** See FUSTIAN.

**Molesworth,** GUILFORD LINDSAY, b. 1828. Engineer in Ceylon and India. *Engineering Formulæ; Railways in India*, 1872.—His brother, WILLIAM NASSAU, 1816–1890, pub. *Moral Philosophy*, 1867, and some historical works.

**Molesworth,** MRS. MARY LOUISA (STEWART, "ENNIS GRAHAM"), b. 1842. English novelist and writer of juvenile tales. *Olivia*, 1894.

**Molesworth,** SIR WILLIAM, 1810–1855. M.P. 1832–41, 1845–55; editor of Hobbes, 16 vols., 1839–45; promoter of reforms in the British colonial and convict system.

**Molière** (properly **Poquelin**), JEAN BAPTISTE, 1622–1673. Greatest of French comic dramatists, from farce and burlesque to refined comedy; especially strong in bold and trenchant satire. As actor and manager he won no success till 1658, and his life, which is imperfectly known to us, was in the main unhappy. Among his most famous plays are *Les Precieuses*

Jean Baptiste Molière.

*Ridicules*, 1659; *Sganarelle*, 1660; *L'Ecole des Femmes*, 1662; *Tartufe*, 1664–67; *Le Festin de Pierre*, 1665; *Le Misanthrope*, 1666; *Le Medecin malgré lui*, 1666; *L'Avare*, 1668; *Le Bourgeois Gentilhomme*, 1671; *Les Femmes Savantes*, 1672; *Le Malade Imaginaire*, 1673. He has been tr. by H. Van Laun, 1875–77, and Miss K. P. Wormeley, 1894–95.

**Molina,** ALONSO DE, 1496–1584. Franciscan and Spanish missionary in Mexico. *Mexico, en casa de Petro de Ocharte*, 1571; *Vocabulario en lengua castellana y mexicana*, 1555.

**Molina,** JUAN IGNACIO, 1737–1829. Chilian Jesuit, banished with his order 1767; resident at Bologna from 1774; author of three histories of Chili, 1776, '82, '87.

**Molina,** LUIS, 1535–1601. Spanish Jesuit, prof. at Evora and Madrid. His book on *Grace and Free Will*, 1588, endeavoring to reconcile Augustine's system with more modern opinions (or, as Protestants would say, Calvin with Arminius), caused much commotion.

**Molina,** TIRSO DE. See TELLEZ.

**Molinari,** GUSTAVE DE, b. 1819. Belgian political economist, prof. Brussels 1851; ed. *Journal des Economistes* since 1881. *Le Sort des Classes Laborieuses*, 1844; *Economie Politique*, 1855; *Dovit Publique*, 1861; *L'Evolution Economique*, 1880.

**Moline.** City of Rock Island co., Ill., on the Mississippi, opposite Rock Island and Davenport, Iowa; chartered 1872. Pop., 1890, 11,995.

**Molinet,** JEAN, d. 1507. Canon of Valenciennes; poet; chronicler of Burgundy 1474–1506.

**Molino del Rey.** Mexican fort, stormed by Americans under Gen. Worth Sept. 8, 1847.

**Molinos,** MIGUEL DE, 1640–1697. Spanish quietist, resident from 1670 at Rome, where he exerted wide and deep influence by his preaching, his correspondence, and his *Spiritual Guide*, 1675; accused by the Jesuits, twice tried by the Inquisition, and imprisoned from 1687.

**Molique,** WILHELM BERNARD, 1802–1869. German violinist and composer.

**Mölk,** HEINRICH VON, 12th cent. Austrian satirist.

**Mollenhauer,** EDWARD, b. 1827. German-American violinist and composer.

**Möller,** HEINRICH, 1488–1524. Dutch Augustinian, prior at Dort and pastor at Bremen, martyred as a Lutheran in Holstein.

**Möller,** PAUL MARTIN, 1794–1838. Danish poet and novelist, prof. at Christiana 1827–31 and Copenhagen 1831–38.

**Mollusca.** Unsegmented animals, with bilateral symmetry, without a skeleton for locomotion, but often having a calcareous, protective shell, univalved or bivalved. They have a muscular, ventral organ of locomotion (foot), a brain (supra-œsophageal ganglia), circum-œsophageal nerve-ring, and sub-œsophageal groups of ganglia. Reproduction is sexual, the animals being either diœcious or hermaphrodite. The sub-kingdom includes the classes *Lamellibranchiata*, *Scaphopoda*, *Gastropoda*, *Pteropoda*, and *Cephalopoda*. The first group has been termed the *Acephala*, and the others grouped as the CEPHALOPHORA (q.v.).

**Molluscoidea.** Attached bilateral unsegmented animals, related to *Mollusca* and *Vermes*, especially the *Gephyrea*. They form the two groups POLYZOA and BRACHIOPODA (q.v.).

**Mollwitz.** Village of Silesia, scene of Frederic II.'s first victory over the Austrians, April 10, 1741, which secured the alliance of France and Bohemia.

**Molly Maguires.** Secret society powerful in the Pa. anthracite region 1867–77. Its many outrages and murders went long unpunished, till some of its leaders were brought to justice by the energy of F. B. Gowen, pres. Reading R. R., and the testimony of James McParlan, a detective who had lived among them as a spy.

**Moloch,** or MOLECH. Phœnician deity, to whom infants were sacrificed; by some held to typify the planet Saturn.

**Molokai.** One of the Hawaiian islands, containing the leper settlement. Area ab. 175 sq. m.

**Molting.** See ECDYSIS.

**Moltke,** HELMUTH CARL BERNHARD, GRAF VON, 1800–1891. Prussian officer from 1822; in Turkey, as military adviser of the Sultan, 1835–39; Chief of Staff 1858; Count 1870, Field-marshal 1871; retired 1888. He planned the campaigns against

General von Moltke.

Denmark 1864, Austria 1866, and France 1870, displaying in the latter the greatest strategic genius of recent times. *Situation in Turkey*, 1841; *Italian Campaign 1859*, 1863; *German-French War*, 1872; *Letters from Russia*, 1877, tr. 1878.

**Moluccas,** or SPICE ISLANDS. E. of Celebes, in lat. 6° N. to 3° S.; held by the Dutch since ab. 1600; noted for their vegetable products. Total area ab. 42,000 sq. m. Pop. ab. 300,000, of mixed races, originally Malay.

**Molybdenite.** $MoS_2$. Molybdenum sulphide, strongly resembling graphite in external appearance; rather widely distributed as a mineral, though not often in large quantity at any one place.

**Molybdenum.** Mo. At. wt. 96, sp. gr. 8.6, sp. ht. .072. Discovered by Scheele 1778; somewhat rare silvery-white

metal, occurring in nature as MOLYBDENITE (q.v.); very hard, and more infusible than platinum. Heated in the air it forms molybdenum trioxide. It is soluble in concentrated sulphuric and nitric acids. It forms three classes of salts, of the general formulæ $MoX_2$, $MoX_4$, and $MoX_6$; also derivatives in which it is pentavalent and trivalent. Some of its compounds find use in analytical chemistry. See WULFENITE and AMMONIUM PHOSPHO-MOLYBDATE.

**Molybdenum Bromides.** Three of the formulæ, $MoBr_2$, $MoBr_3$, and $MoBr_4$, similar to the CHLORIDES (q.v.).

**Molybdenum Chlorides.** $Mo_3Cl_6$ or $MoCl_2$. Dichloride; stable, amorphous yellow substance, insoluble in water; obtained by the decomposition of the higher chlorides under the influence of heat.—$MoCl_3$. Trichloride; obtained as a wool-like sublimate, upon heating the pentachloride in hydrogen; insoluble in water. Its vapor is dark blue.—$MoCl_4$. Tetrachloride; brown crystalline powder, made by heating the trichloride at a red heat in the presence of carbon dioxide; decomposed by water.—$MoCl_5$. Pentachloride; dark-green crystals, mpt. 194° C. It boils at 268° C., forming a dark-red vapor, and is made by heating the metal gently in hydrochloric acid gas.

**Molybdenum Dioxide.** SEE MOLYBDENUM OXIDES.

**Molybdenum Disulphide.** $MoS_2$. Black, graphitic, lustrous powder, made by heating the trioxide with sulphur. It occurs naturally as MOLYBDENITE (q.v.).

**Molybdenum Oxides.** MoO. Molybdenum monoxide; black; made by adding hot caustic potash to the dichloride. —$Mo_2O_3$. Molybdic oxide; black; made by reducing the trioxide.—$MoO_3$. Molybdenum trioxide; white, crystallized substance, made by heating the metal or molybdenite; it forms salts with the alkalies.—$MoO_2$. Molybdenum dioxide; dark-blue; made by gently heating molybdic oxide or the hydroxide $Mo(OH)_4$.

**Molybdenum Tetrasulphide.** $MoS_4$. Dark-brown powder, obtained in small quantities by treating the trisulphide with potassium sulphide.

**Molybdenum Trioxide.** See MOLYBDENUM OXIDES.

**Molybdenum Trisulphide.** $MoS_3$. Reddish or brownish black precipitate, made by treating the alkaline molybdates with hydrogen sulphide.

**Molybdic Acid.** $H_2MoO_4+H_2O$. Made by treating ammonium molybdate with nitric acid. From this are derived many complicated forms. The acids themselves do not exist, but they are represented by salts:

$$2H_2MoO_4=H_2Mo_2O_7+H_2O.$$
$$3H_2MoO_4=H_2Mo_3O_{10}+2H_2O.$$
$$4H_2MoO_4=H_2Mo_4O_{13}+3H_2O.$$
$$10H_2MoO_4=H_2Mo_{10}O_{31}+9H_2O, \text{ etc.}$$

**Molybdite.** $MoO_3$. Molybdic ocher; found occasionally with molybdenite as a product of alteration.

**Mombasa.** Capital of British East Africa Co.; on a coral

The Uganda Railway; unloading railway material on Mombasa Island.

island on e. coast, lat. 4° 4′ S.; held by Portuguese mostly 1505–1698, then by native chiefs; ceded by Zanzibar 1888–91.

**Moment.** Product of a force by its lever arm or distance from an axis, and measure of the tendency of the force to cause rotation around that axis. If no rotation exists, the algebraic sum of the moments of all the forces acting on the body must be zero.

**Moment,** BENDING. Sum of the moments of all the exterior forces on one side of a section in a beam. The rupture of a beam occurs at the section where the bending moment is a maximum. The sum of the moments of all the internal stresses in any section of a beam is called the resisting moment; this is equal to the bending moment

**Momental Ellipsoid.** Useful geometrical interpretation of the expression for the moment of inertia of any rigid body about an axis; first used by Cauchy. Assume any fixed point, O, in the body, and let a radius vector, OQ, move in such a manner and be of such length that the moment of inertia about OQ may be proportional to the inverse square of the length. Under these circumstances the locus of Q is always an ellipsoid, and is called the momental ellipsoid. It may be defined by the geometrical property that any radius vector is equal to some constant divided by the square root of the moment of inertia about that radius vector.

**Moment of Inertia.** The moment of inertia of a particle with respect to a point is its mass multiplied by the square of its distance from that point. The moment of inertia of a body is the sum of the moments of inertia of all its particles. A plane area may have a moment of inertia with respect to a point or axis, each elementary area being multiplied by the square of its distance. See INERTIA.

**Momentum.** Product of the mass of a body into its velocity at any instant: in symbols, Mv. It measures the intensity of an impulse which overcame the inertia of the body and imparted to it the given velocity. See INERTIA and LIVING FORCE.

**Momiers.** Name given in 1818 to evangelical Protestants in Switzerland, who were noted for the fervency of their religion.

**Mommsen,** CHRISTIAN MATTHIAS THEODOR, b. 1817. Prof. at Leipzig 1848, Zurich 1852, Breslau 1854, and Berlin 1858. Since 1858 his works on Roman history, antiquities, law, and government, with the great *Corpus Inscriptionum Latinarum*, and his various investigations in the Italic dialects, display the breadth and compass of his erudition. His greatest work is *Roman History*, 5 vols., 1854–85, tr. 1862–86.—Of his brothers, TYCHO, b. 1819, edited and tr. Pindar; AUGUST, b. 1821, has pub. much on ancient chronology.

**Momus.** In Mythology, son of Night; god of satire and ridicule.

**Mona.** Anglesea; in Pliny and Cæsar; Isle of Man.

**Monachism.** Mode of life followed by monks and hermits; found abundantly among Buddhists, as well as under early and mediæval Christianity. See MONASTICISM.

**Monaci,** ERNESTO, b. 1844. Prof. Rome 1876; writer on Romance philology.

**Monaco.** Smallest independent country of Europe; an hereditary principality on the Mediterranean, 9 m. e. of Nice; noted for its gaming-tables at MONTE CARLO (q.v.). Area 8 sq. m.; pop., 1890, 13,304.

**Monactinellidæ.** Order of *Plethospongiæ*, including Sponges with horny fibers which inclose uniaxial spicules of flint, of various forms. The proportion of horny matter to the silicious is also very variable. Here belongs the Fresh Water Sponge (*Spongilla*), which reproduces both sexually and by special gemmules, and the Boring Sponge (*Clione*), which burrows into the substance of Molluscan shells and is considered one of the enemies of the Oyster.

**Monad.** Ultimate unit of force, possessing indivisibility and indestructibility; immaterial in its nature, and so capable of manifesting vital and mental functions.

**Monadelphia.** Linnæan class of plants, comprising those having the stamens united in one set by their filaments, as in Passion-flower, Cotton, Tigridia, and the garden Geraniums.—In Zoölogy, see MONODELPHIA.

**Monadidea.** Order of Lyssoflagellates, including small, colorless Flagellates that have no very definite area for receiving food. They have one large flagellum, and there may be two paraflagella.

**Monadigerous Layer.** Upper and more uniform layer of protoplasm in *Noctiluca*, from which germs are budded off during reproduction.

**Monadnock.** Mountain in Cheshire co., N. H. Altitude 3,450 ft.

**Monadology.** Philosophical system of Leibnitz, founded on the doctrine of monads.

**Monads.** In Chemistry, elements having a valency of I.

**Monagas,** JOSÉ TADEO, 1784–1868. Pres. or dictator of Venezuela 1847-51 and 1855–58.—His brother, GREGORIO, 1795–1858, was Pres. 1851–55.

**Monandria.** Linnæan class of plants, comprising all those which have but a single stamen; *e. g.*, Mare's-tail (*Hippuris*), Marsh Samphire (*Salicornia*), and certain of the Arrowroot family.

**Monandrous.** Flower with a single stamen.

**Monanthous.** Plant or peduncle having a single flower.

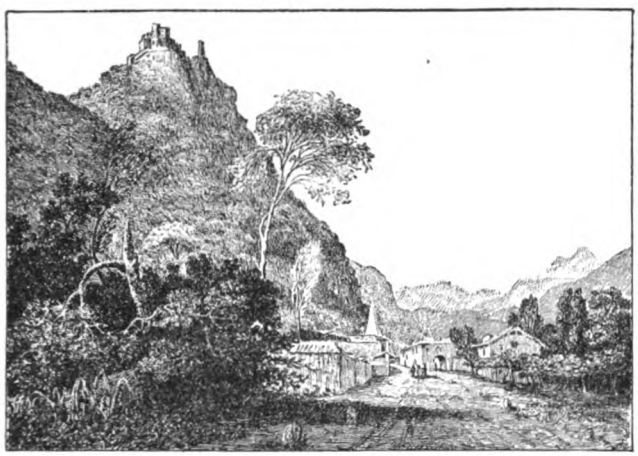
**Monarchianism.** Early doctrine, existing in many forms, principally as Sabellianism, which recognizes only a modal or manifested Trinity.

**Monarchy.** Government by one person, whether emperor, king, prince, duke, or of whatever title. It may be absolute, as in Russia, or limited (constitutional), as in Gt. Britain and Italy.

**Monarchy,** HEBREW. The original form of Hebrew government was tribal patriarchalism. Occasional Shophetim, or Judges, were raised up principally as military deliverers. Settled hereditary monarchy prevailed from ab. 1100 to 588 B.C., when it was overthrown by Babylon.

**Monaster.** Stage preceding the dyaster. See KARYOKINESIS.

**Monastery.** Residence of any body of men, more rarely of women, bound by monastic vows. The first founded in



Monastery of St. Michel; above St. Ambrogio.

England 560; in France ab. 360. Henry VIII. commenced the suppression of small monasteries 1825, to raise revenues for Wolsey's colleges at Oxford and Ipswich.

**Monasticism.** Ascetic life, detached from ordinary relations; originally solitary, afterward more usually in community; regarded by Roman and Eastern churches as a way of perfection superior to the discharge of universal obligations.

**Monastir,** or BITOLIA. Town of Macedonia, 90 m. n.w. of Salonica. Pop. ab. 50,000.

**Monaxonia.** Organisms having but one axis; *e.g.*, *Pyrosoma*, which is haplopolar, the poles being alike, and *Conulina*, which, being cone-shaped, has the poles unlike, and is therefore diplopolar.

**Monazite.** Cerium-lanthananum-didymium phosphate, usually with thorium oxide and silica; it also sometimes contains yttrium and erbium earths. The mountain regions of w. N. C. have recently yielded it in the form of sand or rolled grains in river beds; it is also found in Brazil. The mineral is used in manufacturing mantles for the Welsbach incandescent gas-burners.

**Monboddo,** JAMES BURNETT, 1714–1799. Sheriff of Kincardineshire 1764; Judge, with title of Lord, 1767. His *Origin and Progress of Language*, 6 vols., 1773–92, won much notoriety by deriving man from the monkey. *Ancient Metaphysics*, 6 vols., 1779–99.

**Monck,** CHARLES STANLEY, VISCOUNT, b. 1819. Irish M.P. 1852; Gov.-gen. of Canada 1861–68; Peer 1866.

**Moncontour.** Village of w. France, near Poitiers; scene of a Huguenot defeat Oct. 3, 1569.

**Moncreiff,** SIR HENRY WELLWOOD, D.D., 1750–1827. Pastor at Edinburgh from 1775; Presbyterian leader; biographer of Dr. J. Erskine.—His son, SIR JAMES, 1776–1851, was a judge of session.

**Moncrieff Pits.** Excavations in which heavy guns are placed in coast batteries, when it is necessary to protect them from artillery fire; invented by Sir Colin Scott Moncrieff.

**Monday.** Second day of the week; sacred to the Moon.

**Mondesir,** CHARLES STANISLAS, 1750–1817. French naturalist and explorer, long in S. America; writer on the herbs of New Spain, 1807, and the mines of Peru, 1811–13.

**Mondoro.** One of the Philippine Is. Calapan and Mangarin are the principal settlements. Area 3,925 sq. m., pop. 67,700.

**Mondovi.** Town of Piedmont, scene of Bonaparte's victory over the Sardinians April 22, 1796; sacked by Soult 1799. Pop. ab. 10,300.

**Mone,** FRANZ JOSEPH, 1796–1871. Prof. Heidelberg 1819–27, and Louvain 1827–31; director of state archives at Carlsruhe 1835–68; hymnologist. *Hymni Latini Medii Ævi*, 1854–55.

**Monera.** Simplest beings, supposed to include non-nucleated bits of protoplasm; but nuclei have lately been discovered in most of these forms. They include the GYMNOMONERA (*Protamœba*) and the LEPOMONERA (*Protomyxa*, *Vampyrella*).

**Monet,** CLAUDE. French impressionist; painter of great talent, but producing works of very unequal merit.

**Money.** That thing in any community which fulfills with some degree of completeness the functions of an instrument of exchange, a measure of value, and a means of association. See STANDARDS, MONETARY.

**Money of Account.** System consisting only of an arbitrary scale for measuring the relative values of commodities. The different denominations of such a scale might be represented by paper currency, but not if they had intrinsic value, such as coins possess.

**Moneywort.** *Lysimachia nummularia*. Creeping, yellow-flowered vine of the Primrose family, native of Europe, frequently cultivated and introduced into N. America.

**Monge,** GASPARD, 1746–1818. Prof. of Mathematics at Mezieres 1768, at Paris 1780; Minister of Marine 1792; founder École Polytechnique 1798; Senator 1805. *Statique*, 1788; *Geometrie Descriptive*, 1795; *Application de l'Analyse à la Geometrie*, 1795.

**Monghir.** City of n. e. India, on the Ganges. It has extensive manufactures, especially of iron. Pop. ab. 58,000.

**Mongolian.** Branch of the Scythian family of languages, with scanty literature and little linguistic development; now spoken by a comparatively small population, but once spread wide by Mongolian conquests, particularly ab. 1200.

**Mongolian Race.** Characterized by a yellowish skin, quadrangular short (brachycephalic) head, narrow flat forehead, small nose, projecting cheek-bones, broad face, eyes slanting downward toward the nose, and stiff black hair.

1 Corean. 2. Chinese
3. Siamese. 4. Japanese.

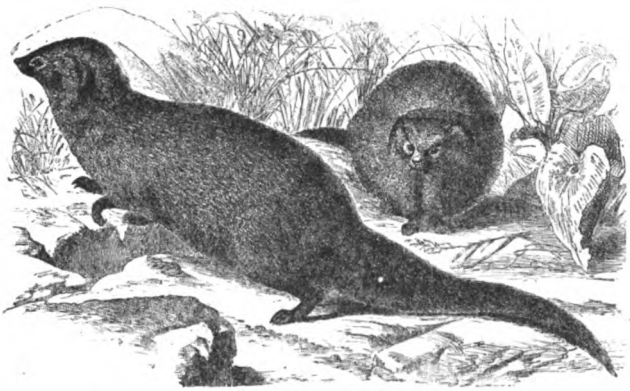
This race inhabits all Asia n. and e. of the Himalayas, and parts of Europe. The principal peoples included are Chinese, Coreans, Finns, Japanese, Calmucks, Lapps, Magyars, Mongolians, Samoyedes, and Tartars.

**Mongolians.** This type originated in Mongolia and spread e. into China and Japan, s. into farther India, and possibly into Malaysia, Polynesia, even as far as Madagascar, and n. and w. into Siberia and Europe. The inhabitants of Mongolia are divisible into eastern, western (black and white Calmucks), and Siberian (Burätes of Irkutsk) groups. They are lazy, nomadic, warlike, brutal, dirty, addicted to drink and tobacco, cowardly and thievish; they live in one room with their domestic animals, and love bright colors. The government is patriarchal;

they dress like the Chinese, both sexes alike, practice concubinage and tribal communism, use Chinese letters, have sharp caste distinction; are Buddhists, but very superstitious. The Burätes number 230,000, the E. Mongols 4,000,000. See CALMUCKS.

**Mongols.** Turanian tribe which arose in Central Asia under Jenghiz Khan 1206–27, and extended its empire from the China Sea to the Dnieper. Several dynasties arose, as in China 1215–1368, where Kubla Khan ruled ab. 1259. Batu Khan, grandson of Jenghiz, overran e. Europe, sacked Moscow, defeated the Teutonic Knights at Leignitz 1241, established the "Golden Horde" at Sarai on the Volga, and held Russia subject 1224–1480. The disintegrating empire was reunited under Tamerlane 1336–1405, who overran the vast territory with sword and torch, subjugated the Turks of Asia Minor 1370–1400, and sacked Moscow 1382. Beber founded the dynasty of the Great Mogul in India 1525–1800; 5,000,000 are thought to have perished by the Mongols. Asia has never recovered from their devastation. They were ruthless conquerors, indifferent to religion, but professing a divine mission: they became Mohammedans. The fragments of their empire have been gradually absorbed by China, Russia, and England.

**Mongoose,** or MUNGOOS. Carnivorous cat-like mammal, of genus *Herpestes* and family *Viverrideæ*. *H. griseus*, native of India, ab. 3 ft. long, including tail, is valued as driving



Mongoose (*Herpestes griseus*).

venomous snakes away from domiciles where it is kept; it successfully attacks even the cobra. Both Asia and Africa have numerous allied species; they are known as ichneumons, and feed on eggs, reptiles, etc.

**Mongrels.** Offspring produced by crossing varieties. See HYBRIDIZATION.

**Monica,** ST., d. 387. Mother of St. Augustine, eminent for piety and faith in the final conversion of her son.

**Monier-Williams,** SIR MONIER, b. 1819. Prof. of Sanskrit at Haileybury 1844–58, and Oxford 1860; knighted 1886; tr. *Sakuntala*, 1853: writer on India, its languages and literature. *Buddhism*, 1889.

**Moniliform.** In Botany and Zoölogy, necklace-like organs or organisms.

**Monimiaceæ.** Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Dicotyledons*, comprising 23 genera and ab. 150 species; natives of the warmer parts of America and Asia, Mascarensian Islands, Australia, and tropical regions of w. Africa.

**Monism.** Theory that all phenomena are manifestations of a single kind of force or substance. This may take the pantheistic form, which asserts a single homogeneous substance, of which all things are modes; or the atomistic form, in which the substances are all of the same kind, but plural.

**Moniteur.** Parisian newspaper, founded 1789; government organ 1800–69.

**Monitor.** 1. Special form of nozzle used in hydraulic mining. 2. Self-dumping skip used in coal mining.

**Monitor,** THE. A floating ironclad battery, with turret and two 11-in. guns, devised by Capt. John Ericsson 1861; victorious over the Confederate ram MERRIMAC (q.v.) in Hampton Roads, March 9, 1862.

**Monitorial System.** Devised by Comenius ab. 1650; adopted and pushed by Andrew Bell in Madras 1795, and by Joseph Lancaster in England ab. 1800; each of these claimed its authorship. It aimed to simplify and cheapen education by mutual instruction, use of slates, diminution of text-books, and other kindred means.

**Monk,** GEORGE, DUKE OF ALBEMARLE, 1608–1670. English general, commander of the Parliamentary army in Scotland 1650. He managed the restoration of Charles II., who made him Privy Councilor and Duke 1660.

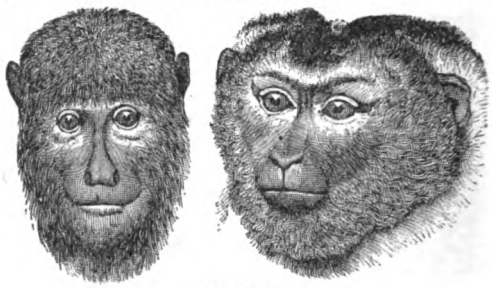
**Monk,** MARIA, ab. 1817–ab. 1850. Pretended ex-nun, whose aspersions on a convent at Montreal deluded many. Of her *Disclosures*, 1836, over 200,000 copies were sold.

**Monkey.** Ram of a pile-driver, or of a hammer used in forging.—Also porous water jar, used in the East, cooled by surface evaporation.

**Monkey-Flower.** Herbs of the genus *Mimulus*, natural family *Scrophulariaceæ*, natives of America, bearing showy, irregular flowers.

**Monkey-Pot.** Large, woody seed-vessel of certain trees of the genus *Lecythis*, natural family *Myrtaceæ*, natives of Brazil. The edible seeds are known as Sapucaya Nuts, and are exported in considerable quantities.

**Monkeys.** Broadly, all the *Quadrumana;* but in contradistinction to Apes, especially the *Platyrrhini* of the New World, though the Macaques, Baboons, and other *Catarrhini* are indif-



Monkeys.
Platyrrhine Face. Catarrhine Face.

ferently termed Apes and Monkeys. While there is great variation in size, appearance, etc., all monkeys resemble Man more closely than they do any other mammals. The differences between the Platyrhine and Catarrhine Monkeys was established in tertiary times. See these groups.

**Monkey Switch.** Railroad switch, operated by a crank attached to a vertical shaft, which is moved by a horizontal lever.

**Monkshood.** See ACONITE.

**Monluc,** BLAISE DE, ab. 1502–1577. French soldier, knighted 1544, Marshal 1574. *Commentaires*, 5 vols.

**Monmouth,** JAMES, DUKE OF, 1649–1685. Reputed son of Charles II. and Lucy Walters; exiled for participation in the Whig conspiracies 1683; leader of armed rebellion June 1685; defeated at Sedgemoor July 6; executed at London July 15.

**Monmouth,** BATTLE OF. In N. J., June 28, 1778. Through Gen. Lee's treachery it threatened to result in a rout of the American forces, but, being rallied by Washington, they held their position and compelled the retreat of the British.

**Monmouth College.** Founded 1856 by United Presbyterians at Monmouth, Warren co., Ill. It has 13 instructors and ab. 300 students.

**Monnier,** HENRI, 1799–1877. French romancer.

**Monnier,** MARC, 1829–1885. French poet and historian of literature, resident at Naples, and from 1864 at Geneva.

**Monnin,** CHARLES FRÉDÉRIC DIETZ, 1827–1896. French senator.

**Monobasic Acid.** See ACID.

**Monocacy.** Stream in Md., near which Gen. Early defeated a Federal force July 9, 1864.

**Monocarpellary.** Ovary consisting of a single carpel.

**Monocentric Eyepiece** FOR TELESCOPES. Central convex lens of crown glass, with concave meniscus of flint glass cemented to each side, all the curves being struck from a common center.

**Monochasium.** Cyme with a single axis.

**Monochlamydeous.** Flowers in which either the calyx or corolla is wanting: generally the latter.

**Monochord.** Instrument for studying the laws of vibrating strings. See SONOMETER.

**Monoclinal.** Strata that dip in one direction only.

**Monocotyledons.** Sub-class of *Spermatophyta* or Flowering Plants, of the class *Angiospermæ*, in which the embryo contains but one cotyledon.

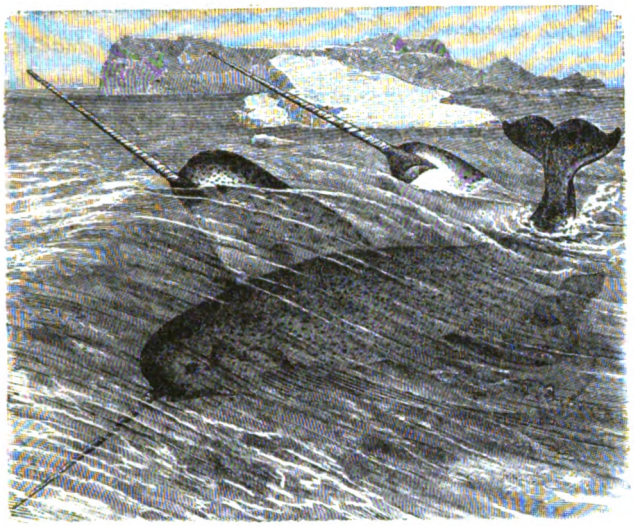
**Monocyclic Crinoids.** Those with but one row of basal plates.

**Monocystidia.** See GREGARINIDÆ.

**Monod,** ADOLPHE, 1802–1856. French Protestant preacher, in Paris from 1847, succeeding his brother, FRÉDÉRIC, 1794–1863, who had succeeded his father, JEAN, 1765–1836.

**Monodelphia.** See PLACENTALIA.

**Monodontidæ** (SQUALORDONTIDÆ, NARWHALS). Family of toothed Whales, having a body 15 or more ft. long and a tusk projecting straight out from the snout for 10 ft. This is



Narwhals.

the left upper incisor, growing from a persistent pulp, and rarely present in the female. The lower jaw has no teeth; the other upper teeth are rudimentary. It lives in Arctic seas, and is known as the Sea-Unicorn.

**Monœcia.** Linnæan class of plants, comprising those having monœcious flowers, as the Oaks, Calla, Cucumber, and Cocks-comb.

**Monœcious.** Plants with diclinous flowers, the staminate and pistillate borne on the same individual.

**Monogamy.** Custom of a man or woman having but one wife or husband at any one time.

**Monogenist.** One who believes, either on the authority of Scripture or as harmonious with the evolution theory, that the human races had a single origin.

**Monogenous Reproduction** (MONOGENESIS). Asexual reproduction; opposed to digenous reproduction, in which two beings must co-operate in generation.

**Monoglyceride.** See GLYCERIDES.

**Monogonopora.** Group of dendrocœlous Turbellarians, with a single sexual opening. It includes the Planarian worms.

**Monogram.** Two or more letters (as the initials of a ruler), combined or interlaced artistically, and sometimes reversed or duplicated, to form a cipher or device on seals, coins, etc.; common in all ages.

**Monograph.** Treatise on a special subject; usually the result of scientific study.

**Monogynia.** Orders of plants which have a single pistil; so called by older writers.

**Monogynous.** Flowers with but one pistil.

**Mono Lake.** In Cal., at e. base of the Sierra Nevada; area 84 sq. m. It has no outlet, and was once much larger.

**Monomania.** Insanity with regard to one subject only. See LUNACY.

**Monomeniscous Eye.** One having a single lens, as opposed to the faceted eye. It may be either retinulate or non-retinulate; each sort may be monostichous, as in larval eyes, or diplostichous, as in the central eye of *Limulus* (retinulate) and in the ocelli of insects (non-retinulate).

**Monomerosomata,** or ACARINA. Group of *Arachnida*, including the LINGUATULIDÆ, TARDIGRADA, and ACARINA (q.v.) proper.

**Monomerous.** Flowers which have but a single member of each circle of parts, as in the Mare's-tail.

**Monometallism.** Restriction of the legal tender coinage of a country to one kind of metal. In recent controversies monometallism usually refers to a gold coinage only, though the term is no less applicable to silver as the sole standard.

**Monomial.** Algebraic expression of one term.

**Monomyaria.** Division of asiphoniate Lamellibranchs, having but one muscle (the homologue of the posterior one in other groups) with which to close the shell. The oyster is an example. See OSTREIDÆ and PECTINIDÆ.

**Monongahela.** One of the head branches of the Ohio. It heads in W. Va. and flows n. to its junction with the Alleghany River at Pittsburg. Length 300 m., area of drainage basin 7,318 sq. m.

**Monopetalous.** Corolla consisting of a single petal; also, erroneously, corolla whose petals are united. See GAMOPETALOUS.

**Monophylitic Origin** OF GROUPS OF ANIMALS. Descent from a common ancestor. On this theory, all the sub-kingdoms of *Metazoa* are derived from a single species of *Protozoa*.

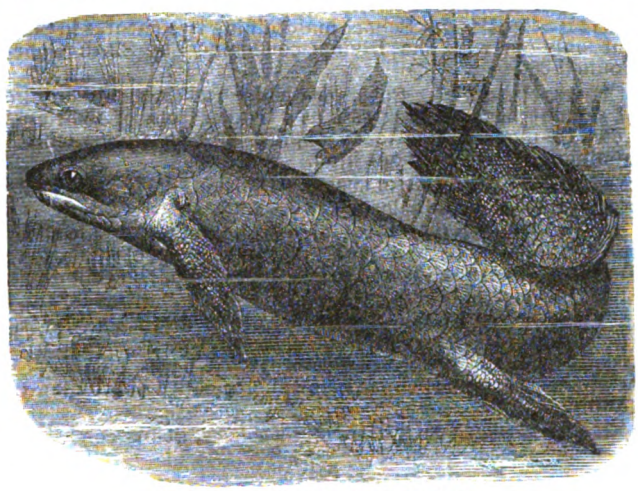
**Monophyllous.** Plant bearing a single leaf; also a calyx or corolla consisting of a single leaf (sepal or petal).

**Monophyodont.** Having but one set of teeth; due to suppression either of the milk teeth or of the second set.

**Monophysites.** School which, acknowledging Christ's true humanity of soul and body, maintained it to be so fused with the Godhead as to form one nature; condemned by Council of Chalcedon, 451.

**Monoplast.** See GYMNOCYTODE.

**Monopneumona.** Sub-order of *Dipnoi*, including the single genus *Ceratodus*, an Australian herbivorous fish, with the swim-bladder functioning as a lung. The body is covered with large cycloid scales; the vomer bears incisor-like teeth,



Monopneumona (*Ceratodus forsteri*).

and the palate and lower jaws molar-like plates. The fins have rays on both sides of the jointed shaft. There are four gills and five arches; the hyoidean arch bears a pseudobranch. Ureters open by a common duct into the cloaca. There is a pair of abdominal pores. The conus arteriosus has valves in it, as in the Ganoids. These fishes grow as long as six feet. The flesh is salmon-like and esteemed as food.

**Monopodium.** Vegetable axis which grows continuously from the summit, while lateral similar branches are produced below.

**Monopolies,** NATURAL. Those forms of production or exchange which from their nature can be carried on by only one person or corporation at a time; as a car route on a certain street, or furnishing a city with water, light, or heat, or the exploitation of mines or other limited deposits of raw materials.

**Monopoly.** Natural or legal right or opportunity for the exclusive production, transfer, manufacture, or sale, of any given commodity. Unless legalized, as in the case of patents and copyrights, monopoly confers no rights. An agreement for a monopoly is unenforceable.

**Monopoly Value.** Value of an article, depending not on the amount of labor put on it, but on the impossibility of reproducing it; otherwise called scarcity value.

**Monoprionidian.** Having polyps arranged in a row on one side of the stem, as in some Graptolites.

**Monopsea.** TRACHOMEDUSÆ and NARCOMEDUSÆ (q.v.).

**Monopteral.** Circle of columns carrying a roof but not inclosing a wall, and themselves constituting the structure.

**Monopylæa.** Order of siliceous *Radiolaria*, in which the central capsule is cone-shaped, with the base perforated by pores. There is one nucleus; the skeleton is monaxonic and outside the capsule. Here are included the sections: *Plectida*, with loose siliceous spicules; *Cyrtida*, with a bell-shaped shell; *Botryda*, with a many-chambered shell, but only one central capsule; *Spyrida*, with two-chambered or twinned shell and only one central capsule; and *Stephida*, with a shell composed of rings.

**Monorhina.** See CYCLOSTOMI.

**Monosepalous.** Calyx consisting of a single sepal; erroneously, calyx whose sepals are united. See GAMOSEPALOUS.

**Monosiphonous.** Such red seaweeds as have a single row of tubular cells composing each filament or branch.

**Monosporea.** See COCCIDÆ.

**Monostichous.** Leaves developed in a single vertical row on the stem.

**Monostichous Eye.** One having the cells concerned in vision in a single layer. It may be non-retinulate and monomeniscous as in eyes of larvæ of Insects, or may be retinulate and monomeniscous or polymeniscous as in lateral eyes of *Limulus*.

**Monostomidæ.** See DISTOMEA.

**Monostylous.** Flowers with a single style.

**Monosyllabic Languages.** Those having the root identical with the word, as in Chinese and some other tongues of Asia; lowest form of language.

**Monothalamia.** See RETICULARIA.

**Monothalamous.** In Lichenology, certain apothecia.

**Monotheism.** Belief in a single Deity; opposed to Polytheism.

**Monothelites.** School maintaining two natures in Christ, but only one will, the Divine; condemned by Sixth General Council 680.

**Monothermal.** Substance which radiates only one kind of radiant heat, as rock salt at a temperature of 150°; analogous to monochromatic as applied to a substance emitting luminous rays of only one kind.

**Monotremata** (MOLLUSKS). Division of the *Stylommatophora*.—For mammals, see PROTOTHERIA.

**Monotriglyph.** Space of one triglyph, employed as a module to denote and determine the intercolumniation in Doric architecture, instead of the diameter of the column as in the other classic orders.

**Monotropaceæ.** Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Dicotyledons*, comprising 9 genera and ab. 10 species of saprophytic herbs, natives of the temperate regions of the n. hemisphere; called the Indian-Pipe family.

**Monotypic.** In Botany and Zoölogy, genus consisting of a single species.

**Monozoa.** See RADIOLARIA.

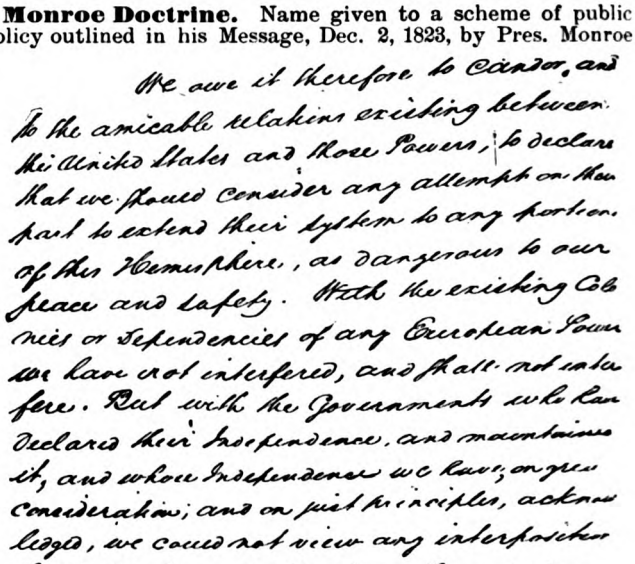
**Monro,** ALEXANDER, F.R.S., 1697–1767. First prof. of Anatomy in Edinburgh 1721–59. *Osteology*, 1726; *Comparative Anatomy*, 1744; *Observations*, 1758; *Inoculation*, 1765.—His son, ALEXANDER, 1733–1817, held the same chair 1759–1808, and wrote on *The Nervous System*, 1783; *Fishes*, 1785; *Brain, Eye, and Ear*, 1797.—A third ALEXANDER, 1773–1859, succeeded him, and pub. *Anatomy*, 1813.

**Monroe,** JAMES, 1758–1831. Fifth President U. S.; delegate to Congress 1783–86; U. S. Senator 1790–94; Minister to France 1794–96; Gov. of Va. 1799–1802 and 1811; negotiator, with R. R.

James Monroe.

Livingston, of the purchase of Louisiana 1803; Minister to England 1803–7; Sec. of State 1811–17, and of War 1814–15; Pres. 1817–25. Florida was acquired 1819, and the Missouri Compromise adopted 1820.

**Monroe Doctrine.** Name given to a scheme of public policy outlined in his Message, Dec. 2, 1823, by Pres. Monroe


We owe it therefore to candor, and to the amicable relations existing between the United States and those Powers, to declare that we should consider any attempt on their part to extend their system to any portion of this Hemisphere, as dangerous to our peace and safety. With the existing Colonies or Dependencies of any European Power we have not interfered, and shall not interfere. But with the Governments who have declared their independence, and maintained it, and whose independence we have, on great consideration, and on just principles, acknowledged, we could not view any interposition for the purpose of oppressing them, or controlling in any other manner their destiny by any European Power, in any other light than as the manifestation of an unfriendly disposition towards the United States.

Fac-simile of a portion of Monroe's Message.

and practically though never formally adopted by the U. S. It was much quoted 1895–96 in relation to the boundary between British Guiana and Venezuela.

**Monrovia.** Capital of Liberia; founded 1822.

**Mons.** Capital of Hainault, Belgium; center of a rich coal district; important for its manufactures; taken by Louis of Nassau May 1572; retaken by the Spaniards Sept. 1572; surrendered to the French 1691; restored 1697; reduced by Marlborough and Prince Eugene 1709; ceded to Austria 1714; taken by the French 1746 and 1792; lost 1815. Pop., 1891, 25,187.

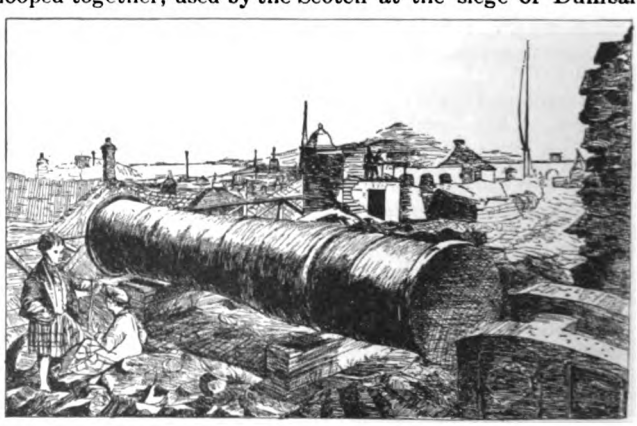
**Monseigneur.** Title of the French dauphin, as till 1661 of princes, prelates, and some nobles.

**Monsell,** JOHN SAMUEL BEWLEY, LL.D., 1811–1875. English hymnist.

**Monserrat,** JOAQUIN DE, ab.1710–ab.1770. Viceroy of Mexico 1760–66; organizer of the militia.

**Monsieur,** PEACE OF. Extorted from Henry III. of France in 1576 by a coalition of Huguenots and moderate Catholics under the lead of the Duc d'Alencon ("Monsieur"). It revoked all sentences passed against Huguenots, sanctioned the exercise of the Reformed religion throughout France, secured an equal representation of Protestant and Catholic judges in the Parliaments, and provided for a convocation of the States-General within six months, but was soon annulled.

**Mons Meg.** Huge cannon, made of bars of wrought iron hooped together, used by the Scotch at the siege of Dumbar-



Mons Meg, Edinburgh Castle.

ton 1489. The gun was constructed under the auspices of James II. of Scotland and named Mons after the blacksmith who cast it and Meg after his wife. It is 13 ft. 3½ in. long, 27½ in. in diameter at the mouth, the bore being 20 in.

**Monsoon.** Regular seasonal wind of India and other tropical countries, where the wind alternately blows off and on shore, according as the interior of the land is cold or warm. The s.w. monsoon lasts in Ceylon from ab. May 30 to Nov. 15, but in Bengal from end of June to September.

**Monstrance.** Holder used in R. C. worship to exhibit the host or sacred wafer; transparent, of glass or crystal, and circular; held in position by a frame, usually of gold or silver gilt, now generally ornamented with diverging rays like a picture of the sun, and supported by a stand; also called Ostensory.

**Monstrelet,** ENGUERRAND DE, d. 1453. French chronicler. His work, continuing Froissart's and extending 1400–44, was tr. 1810.

**Monstrosity.** Any organized being, having a preternatural perversion of every part or certain parts only. The causes probably are, the accidental changes experienced by the fœtus at some time of its uterine existence, the influence of maternal imagination, or defect of germ.

**Mont.** Egyptian god of war.

**Montagnards.** Radical members of the National French Convention ab. 1792–95; so named as sitting in the higher part of the hall.

**Montagne,** JEAN FRANCOIS CAMILLE, 1784–1866. French botanist. *Florula Boliviensis*, 1839; *Plantes cellulaires du Voyage au Pôle Sud*, 1837–40; *Historia fisica, politica, y natural de Cuba, tomo IX., Botanica Criptogamia*, 1845; *Cryptogamia guyanensis*, 1835–49; *Sylloge generum specierumque cryptogamarum*, 1856.

**Montagu,** BASIL, 1770–1851. English reformer of bankruptcy laws; editor of Bacon 1825–34.

**Montagu,** ELIZABETH ROBINSON, 1720–1800. English writer and social leader. *Shakespeare*, 1769; *Correspondence*, 4 vols.

**Montagu,** LADY MARY WORTLEY, 1690–1762. English letter writer, friend and then enemy of Pope. Works, 3 vols., 1837.—Her son, EDWARD WORTLEY, 1713–1776, wrote *Ancient Republics*, 1759, and an autobiography, pub. 1869.

**Montague,** CHARLES. See HALIFAX.

**Montaigne,** MICHEL EYQUEM DE, 1533–1592. French essayist, remarkable for the felicity of his style, his shrewd caustic humor, and his skeptical habit of mind. His *Essays*, 1580–88, took rank at once as a classic, and have always been widely read.

**Montalembert,** CHARLES FORBES RENÉ DE TRYON, COMTE DE, 1810–1870. French liberal Catholic; Academician 1852; author of *Monks of the West*, 6 vols., 1860–67. He was a generous enthusiast, the steady friend of freedom, twice in collision with the authorities, and condemned to penalties 1831 and 1858.—His ancestor, MARC RENÉ, MARQUIS, 1714–1800, wrote on fortification, and brought casemates into prominence.

**Montalvan,** JUAN PEREZ DE, 1602–1638. Spanish dramatist of the school of Lope de Vega; author also of prose tales.

**Montalvo,** GARCIA ORDONEZ DE, b. ab. 1440. Spanish author or editor of *Amadis of Gaul*, ab. 1490.

**Montana.** One of the northwestern States; area 146,080 sq. m. It is naturally divisible into two parts; the western, which consists of an alternation of mountain and valley, the former rising to heights of 10,000 to 11,000 ft. and generally well covered with forests, the latter having elevations of from 2,000 to 5,000 ft., and consisting of plains, stretching e. from the base of the mountains with a gentle incline, devoid of forests, covered only with grass, and broken only occasionally by groups of hills. The Missouri and the Columbia head in M. by numerous branches. Of the geology of the mountain region we know little. The plains are overlaid entirely by Cretaceous beds. The industries are agricultural, with stock raising and mining. The principal mineral products are gold, silver, and copper; coal also is mined to some extent. M. was a part of the Louisiana purchase, and afterward successively of the territories of Louisiana, Missouri, Nebraska, and Dakota. It was organized as a separate Territory, with practically its present boundaries, 1864. The region first became definitely known through the explorations of Lewis and Clark, 1803–6. The first settlers began to enter it ab. 1861 on the discovery of gold; it soon swarmed with adventurers from all parts of the world. The recent population is of more stable character. It was admitted as a State 1889. Capital, Helena. Pop., 1890, 132,159.

**Montanelli,** GIUSEPPE, 1813–1862. Tuscan patriot, poet, and journalist.

**Montanism.** Movement favoring a very rigorous discipline, beginning ab. 150 in Phrygia, in the form of a revelation to Montanus; promulgated as a more perfect disclosure of the Gospel. It exalted prophecy above the episcopate, and was finally rejected as a heresy. Its chief representative was Turtullian.

**Montargis.** Town of France, department of Loiret, 29 m. s. of Fontainebleau, at the junction of the Briare and Loing canals, with manufactures of paper and india-rubber goods. Here Madame Guyon, 1648–1717, the Quietist, was born. Pop. 9,175.

**Montauban.** Town of s. France, on the Tarn, 31 m. n. of Toulouse; former Huguenot center; besieged 1621; seat of a theol. sem. Pop., 1891, 22,616.

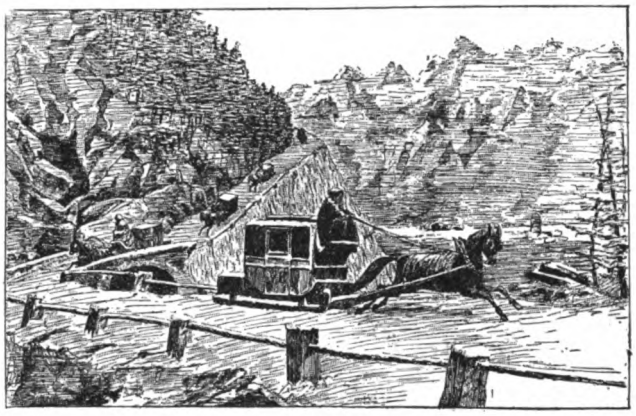
**Montauk Point.** E. extremity of Long Island.

**Montbars.** French buccaneer in W. Indies, terrible to the Spaniards ab. 1670; celebrated in plays and romances.

**Mont Blanc.** See BLANC, MT.

**Montcalm,** LOUIS JOSEPH, MARQUIS DE, 1712–1759. French general, commanding in Canada from 1756; killed in Wolfe's attack on Quebec.

**Mont Cenis.** Alpine summit between France and Italy; ht. 11,451 ft. A road over its pass, 6,773 ft. high, was made by Napoleon 1803–10. The railway tunnel, built 1857–70, is 7¾



Descending Mont Cenis in Winter.

m. long; being the longest in the world, except that of St. Gothard, which is 1½ m. longer. It passes under the Col de Fréjus, ab. 16 m. s.w. from the pass.

**Montchrestien,** ANTOINE DE, 1575–1621. French tragic poet.

**Mont de Piété.** National pawnbroking institution in Paris, charging 9 per cent on loans. The system is ancient in China, and was introduced into Italy ab. 1463 to protect the poor from usury.

**Monte.** Common gambling game in Spanish America, played with Spanish cards. The short pack of 40 cards with four suits, money, clubs, cups and swords, is used.

**Montebello.** Village of Piedmont where Lannes defeated the Austrians June 9, 1800. Here, May 20, 1859, the allied French and Sardinians defeated the Austrians.

**Monte Carlo.** Town of MONACO (q.v.) 1 m. n. e. of the town of same name; seat of the famous gambling establishment. Pop., 1890, 3,794.

**Monte Casino.** In Middle Italy, seat of the mother-house of the Benedictines, founded by St. Benedict of Nursia 529; long an eminent seat of piety, literature, and art; secularized 1866.

**Monte Cristo.** Italian islet, 30 m. s. of Elba; celebrated in Dumas' romance.

**Montecuculi,** RAIMONDO, COUNT OF, 1608–1681. Austrian general commanding an army against the Turks 1660; Prince 1679. With the French he won the great victory of St. Gothard Aug. 1, 1664. *Opere*, 1823.

**Monte Diablo.** Peak in the Coast Ranges, e. of the Bay of San Francisco. Elevation 3,856 ft.

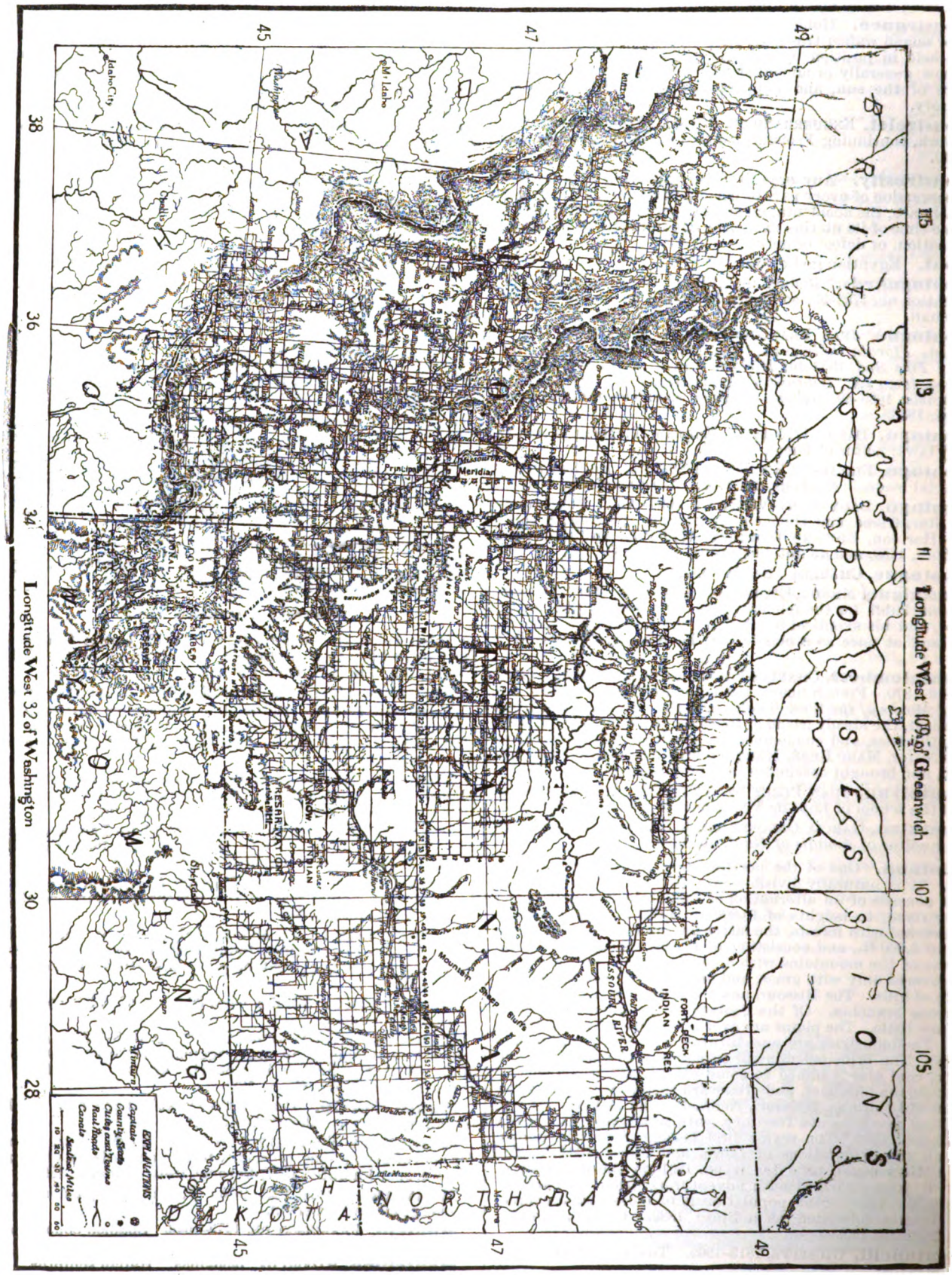
**Montefiore,** SIR MOSES, 1784–1885. English Jew, eminent for acts of beneficence, especially to his co-religionists throughout Europe; knighted 1837, Baronet 1846. *Diaries*, 1890.

**Montégut,** ÉMILE, 1826–1895. French critic; translator of Shakespeare and Emerson.

**Montejo,** FRANCISCO DE, 1479–1549. Spanish conqueror of Yucatan 1528–41.

**Montelupo,** BACCIO DA, 1450–1533. Italian sculptor.

**Montemayor,** JORGE DE, ab. 1515–1561. Portuguese poet and novelist, who wrote in Spanish. His *Diana Enamorada*, 1558, was extensively tr., and continued by Pérez, Polo, and Tereda, 1564–1627.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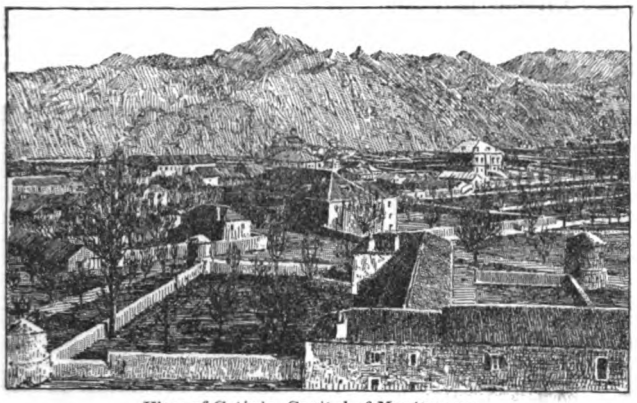
Longitude West 32 of Washington
Principal Meridian
Helena
Butte
Anaconda
Deer Lodge
Missoula
Kalispell
Great Falls
Lewistown
Miles City
Billings
Bozeman
Livingston
Dillon
Virginia City
Ennis
Philipsburg
Hamilton
Stevensville
Thompson Falls
Plains
Libby
Troy
Eureka
Whitefish
Fort Benton
Havre
Chinook
Malta
Glasgow
Wolf Point
Poplar
Scobey
Plentywood
Opheim
Culbertson
Fort Peck
Fort Keogh
Fort Custer
Fort Shaw
Fort Missoula
Fort Harrison
Fort Assiniboine
Fort Maginnis
Fort Ellis
Fort Logan
Fort Mizpah
Fort Peck Indian Reservation
Flathead Indian Reservation
Blackfeet Indian Reservation
Crow Indian Reservation
Cheyenne Indian Reservation
Fort Belknap Indian Reservation
Fort Berthold Indian Reservation
Standing Rock Indian Reservation
Yellowstone National Park
Glacier National Park
Little Missouri River
Yellowstone River
Missouri River
Bitter Root Mountains
Rocky Mountains
Little Rocky Mountains
Big Belt Mountains
Little Belt Mountains
Bear Paw Mountains
Sweetgrass Hills
Cypress Hills
Pryor Mountains
Big Horn Mountains
Wind River Mountains
Absaroka Range
Gallatin Range
Tobacco Root Range
Ruby Range
Bitter Root Range
Cabinet Range
Mission Range
Swan Range
Flathead Range
Lewis and Clark Range
Little Belt Range
Big Belt Range
Bear Paw Range
Sweetgrass Range
Little Rocky Range
Big Horn Range
Wind River Range

**Montenegro.** Principality e. of the Adriatic. Its surface is mountainous. Agriculture and all the arts of civiliza-



View of Cetinje, Capital of Montenegro.

tion are in a backward condition; the people are warlike. Area 3,506 sq. m., pop. ab. 230,000.

**Montenotte.** Village of Piedmont, 26 m. w. of Genoa; scene of Bonaparte's first victory over the Austrians, April 12, 1796.

**Montepin,** Xavier Aymon de, b. 1824. French romancer and playwright.

**Monterey.** Capital of Nuevo Leon, n. e. Mexico; founded ab. 1581; captured, with its garrison of 10,000 men, Sept. 23, 1846, after 3 days' siege and a series of assaults, by 6,650 Americans under Gen. Taylor. Pop. ab. 46,000.

**Montero,** Lizardo, b. 1832. Peruvian admiral and general; acting pres. 1881–83.

**Monte Rosa.** One of the Pennine Alps, between Italy and canton Valais. Four of its peaks are over 14,000 ft. high; the chief is 15,217 ft.

**Montesinos,** Antonio de. Spanish Dominican, missionary in St. Domingo 1511, and later in Porto Rico; persecuted for opposing the enslavement of the natives.

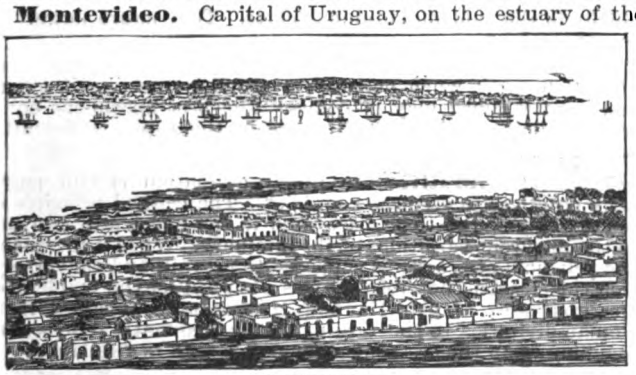
**Montesinos,** Fernando, 1593–1655. Spanish historian of Peru 1640–52.

**Montespan,** Françoise Athenais, Marquise de, 1641–1707. Mistress of Louis XIV. ab. 1668–82, succeeding La Vallière and superseded by Mme. de Maintenon.

**Montesquieu,** Charles Louis de Secondat, Baron de, 1689–1755. Pres. Parliament of Bordeaux 1716; Academician 1728. His *Persian Letters*, 1721, satirized French society. *Greatness and Decadence of the Romans*, 1734. His famous *Spirit of Laws*, 1748, was followed by a *Defense*, 1750.

**Monteverde,** Claudio, 1567–1643. Italian musician, most notable genius in the coterie of reformers whose labors produced the lyric drama. (See Opera.) Violinist to the Duke of Mantua, then ducal chapelmaster, finally chapelmaster at St. Mark's, Venice. As composer of secular pieces in the polyphonic style, he introduced innovations, such as the use of dissonances without preparation and the dominant seventh chord, and showed a tendency away from the church modes and toward the modern system of tonality. His chief significance is in the history of opera. In *Orfeo*, 1608, *Arianna*, a ballet, *Ballo delle ingrate*, and an anomalous semi-dramatic piece called *Il Combattimento di Tancredi e Clorinda*, he opened the way to modern dramatic music, especially instrumental. The familiar tremolo of the violins is his invention, and was first used in the *Combattimento*.

**Montevideo.** Capital of Uruguay, on the estuary of the



Montevideo.

Rio de la Plata; settled 1726; taken by the British 1807; attacked by Argentines 1842–51. It has a large commerce in hides, tallow, etc. Its importance is of recent growth. Pop., 1892, with suburbs, 238,080.

**Montez,** Lola, 1818–1861. Irish dancer, mistress 1846–48 of Louis I. of Bavaria, who made her Countess of Landsfeld; in the U. S. from 1851. *Autobiography*, 1858.

**Montezuma,** 1479–1520. Last emperor of Mexico 1503. Cortez abused his friendship and held him a prisoner. He died after being struck with stones while trying to appease his subjects.

**Montfaucon,** Bernard de, 1655–1741. French classical scholar, whose work upon Greek paleography 1780 is still unsurpassed. *L'Antiquité expliquée et representée en figures*, 13 vols., 1719–24.

**Montferrat.** Duchy of n. Italy 1574–1703; previously a marquisate. Some of its ruling family were prominent in the Crusades.

**Montfort,** Simon de, ab.1160–1208. Leader of the crusade against the Albigenses 1208–18; killed at the siege of Toulouse. —His son, Simon, Earl of Leicester, ab. 1206–1265, married Henry III.'s sister, but sided with the barons against the king; summoned parliament of 1265, and was long the chief man in England.

**Montgolfier,** Joseph Michael, 1740–1810. French inventor, with his brother, Jacques Étienne, 1745–1799, of the balloon. See Balloon.

**Montgomery.** Capital of Alabama and Montgomery co., on the Alabama; settled 1817. It has some manufactures and considerable trade. The river is navigable, and, with five railroad lines, affords ample communications. Pop., 1890, 21,883.

**Montgomery,** or **Montgomerie,** Alexander, ab.1545–ab.1613. Scottish poet.

**Montgomery,** Florence Sophia, b. 1847. Irish novelist and writer of juvenile tales. *Misunderstood*, 1869.

**Montgomery,** Gabriel, Comte de, d. 1574. Slayer of Henry II. of France in a tournament 1559; later a Huguenot, prominent in the civil wars.

**Montgomery,** James, 1771–1854. English poet, twice fined and imprisoned as ed. Sheffield *Iris*, 1794–1825. His talent was chiefly lyric, and his hymns, many of which are widely used, are better than his more ambitious work.

**Montgomery,** James, 1814–1871. Free-soil leader in Kansas 1857–61; colonel of colored troops 1862–64.

**Montgomery,** John Berrien, U.S.N., 1794–1873. Distinguished in the wars with England, Algiers, and Mexico; Commodore 1862, Admiral 1866.

**Montgomery,** Richard, 1736–1775. American general, b. in Ireland; commander of an expedition against Canada. He captured Fort Chambly and Montreal, and was killed in the attack on Quebec, Dec. 31, 1875.

**Montgomery,** Robert (orig. Gomery), 1807–1855. English author of *Satan*, 1829, and other epics, lampooned by Macaulay 1830, and of many sacred lyrics, 1848–55, of more merit, but less known.

**Month.** Originally, period of the moon's synodical revolution, or time from one new moon to the next; viz., 29d., 12 h., 44m., 2.684s., or approximately 29½ days. In Mohammedan and other countries using the so-called lunar calendar it still has this significance. In the Julian and Gregorian calendars all attempt to adjust the divisions of time to the moon's motion was abandoned, and an arbitrary value of the month adopted.

**Montholon,** Charles Tristan, Comte de, 1782–1853. French soldier, companion and biographer of Napoleon at St. Helena; imprisoned 1840–48 for complicity in Louis Napoleon's attempt at Boulogne; Deputy 1849.

**Monti,** Luigi, b. 1830 in Sicily. U. S. Consul at Palermo 1861–73; author and translator. *Leone*, 1882.

**Monti,** Vincenzo, 1754–1828. Italian poet and dramatist, prof. Pavia 1801. His best work is a version of the *Iliad*.

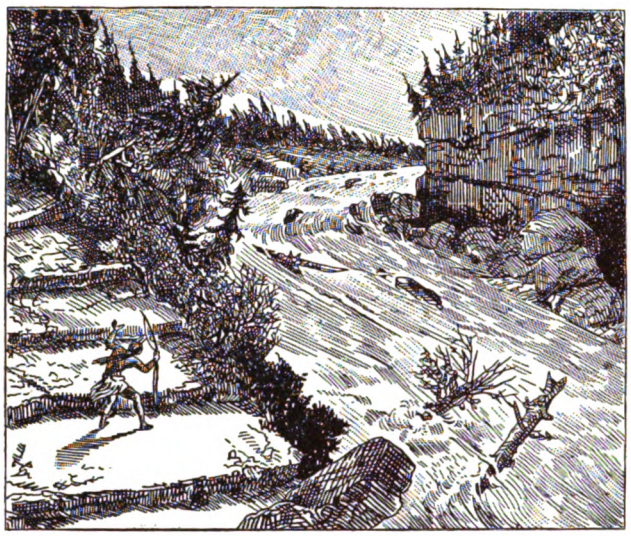
**Montiano y Luyando,** Agustin de, 1697–1764. Spanish dramatist and poet.

**Montmirail.** Village of France, 55 m. e. of Paris. Here Napoleon defeated the Allies Feb. 11 and 14, 1814.

**Montmorency,** Anne, first Duc de, 1492–1567. Constable of France 1538–41 and 1547; defeated by Philip II. at St. Quentin 1557, and by Huguenots at Dreux 1562; mortally wounded at St. Denis.—His grandson, Henri, 4th duke, 1595–1632, became Admiral 1612, and was beheaded for rebellion.

**Montmorency,** Falls of. In Canada, 8 m. n. e. of Que-

bec; 250 ft. high. A mile above the precipice, over which the waters take their final leap, are the natural steps, formed by



Montmorency Falls.

the action of the water on the rocks. The region is a summer resort.

**Montpelier.** Capital of Vermont and of Washington co.; on the Winooski, 40 m. s. e. of Burlington. Pop., 1890, 4,160.

**Montpellier.** City of s. France, 6 m. from the Gulf of Lyons. It has mediæval remains, a botanic garden, and an extensive trade. Pop., 1891, 69,258.

**Montpensier,** ANNE MARIE LOUISE D'ORLEANS, DUCHESSE DE, 1627–1693. Cousin of Louis XIV.; partisan of the Fronde; secretly married to Lauzun 1681. Her *Memoires* were pub. 1729.

**Montpensier,** ANTOINE MARIE PHILIPPE LOUIS D'ORLEANS, DUC DE, 1824–1890. Youngest son of Louis Philippe; husband of Queen Isabella's sister; in Spain 1848–69.

**Montpensier,** CATHERINE MARIE DE LORRAINE, DUCHESSE DE, 1552–1596. Sister of the Guises; active in the wars of the League.

**Montreal.** Largest city and chief commercial port of Canada; on an island at the junction of the St. Lawrence and the Ottawa; settled by the French 1611–42. When Cartier landed here 1535 he found a large Indian settlement called Hochelaga. In 1603 Champlain found no traces of the Indian town, which had been destroyed by a rival tribe. M. became the center of the fur trade ab. 1700. It surrendered to the English 1760, and has rapidly developed in commercial importance. Pop., 1891, 216,650.

**Montrésor,** FRANCES FREDERICK, b. 1862. English novelist. *Into Highways and Hedges*, 1895; *One Who Looked On*, 1895; *False Coin or True*, 1896.

**Montrose,** JAMES GRAHAM, MARQUIS OF, 1612–1650. Scottish Covenanter 1637–40, royalist from 1644; zealous idealist and active partisan; ennobled by Charles I. 1644; author of a famous song, *I'll Never Love Thee More*. He surrendered 1646 and went abroad, but returned 1650, attempted a rising in the Highlands, and was executed.

**Monts,** PIERRE DU GUAST, ab.1560–1611. French grantee of "Acadia," Canada, and director of a company to colonize it 1603–4.

**Mont St. Jean.** Hamlet near Waterloo, from which the battle was sometimes named.

**Montserrat.** One of the Lesser Antilles, W. I.; lat. 16° 42′ N.; discovered 1493; held by Britain, with two intervals, from 1632. Area 32 sq. m., pop. ab. 11,000.

**Montt,** MANUEL, 1809–1880. Pres. of Chili 1851–61.—His son, JORGE, b. 1847, naval officer, was commander against Balmaceda, and Pres. 1891–96.

**Montufar,** LORENZO, b. 1823. Central American author and Minister of State.

**Montyon,** JEAN BAPTISTE ROBERT AUGER, BARON DE, 1733–1820. French founder of a prize of virtue 1782, and in 1815 of others to writers, discoverers, or inventors, whose work is regarded as beneficial to mankind. Four prizes, each of 10,000 francs, are annually awarded by the Academy.

**Moody,** DWIGHT LYMAN, b. 1837. American lay evangelist, whose work began in Chicago 1856. He was in England with Ira D. Sankey 1873–75. Of late years he has been chiefly occupied with his training-schools at Northfield, Mass.

**Moon.** Satellite of the earth. Greatest distance from the earth 252,972 m., least 221,614, mean 238,840; diameter 2,163 m. Volume $\frac{1}{49}$ that of the earth; mass $\frac{1}{80}$; parallax 57′ 2″; gravity at surface $\frac{1}{6}$ that at surface of earth. The revolution

The Moon, First Quarter (inverted, as seen through telescope).

on the axis is performed in the same time as that about the earth; viz., 27d. 7h. 43m. 11.545s., so that the same face is always presented to the earth. The moon is destitute of atmosphere and water, so that life as we know it cannot be supposed to exist there.

**Moon,** MOUNTAINS OF THE. Mythical range, so named by Ptolemy, and stretched by old geographers across central Africa; variously identified in recent years.

**Mooney,** EDWARD LUDLOW, 1813–1887. American portrait painter.

**Mooney,** JAMES, b. 1861. American writer on Irish antiquities and Indian customs.

**Moon-Flower.** *Ipomœa bona-nox.* Climbing annual plant of the natural family *Convolvulaceæ*, native of India; extensively planted for ornament, its white flowers being five or six inches broad.

**Moon Goddess.** Among the Greeks, Seléné, a beautiful goddess with long wings and a diadem, who was subsequently identified with Artemis, as well as with Hecaté and Persephoné. She is also called Phœbe, as the sister of Phœbus, the god of the Sun. The love of the Moon Goddess for Endymion has been a frequent subject for artists from classical times. The Romans called her Luna, and had three altars for her in Rome. She was worshiped at the new and full moon.

**Moonseed.** *Menispermum canadense.* Vine of the natural family *Menispermaceæ*, native of e. N. America.

**Moonshiners.** Illicit distillers in the Southern States, chiefly in the wild mountainous parts. They figure largely in romance.

**Moonstone.** 1. Form of feldspar, usually adularia or albite, showing, when polished, a peculiar milky opalescence and a pale bluish play of colors. The best specimens come from Ceylon and from St. Gothard in the Alps. 2. Selenite, or crystallized gypsum.

**Moon Superstitions.** Lunar divination is still popularly practiced in civilized countries. The central principle of moon adoration is to be discovered in the effect still ascribed to the apparent variations of the luminary. When it increases, the principal of growth is supposed to prevail, and conversely. For this reason the crescent was assigned as the emblem of the goddesses of growth, and this ornament passed from Roman divinities to the Virgin, who is frequently represented standing upon the crescent moon. See MAN IN THE MOON.

**Moonworts.** Fern-like plants of the genus *Botrychium*, natural family *Ophioglossaceæ*, including several species, of wide geographic distribution.

**Moorcroft,** WILLIAM, ab.1770-1825. English explorer in n. India and Bokhara from 1808. *Travels*, 1841.

**Moore,** ALBERT, b. 1840. English painter, eminent in decorative composition and figure balance after the methods of Raphael and the antique.

**Moore,** CHARLES, 1814–1881. English paleontologist, discoverer of beds between the Trias and Lias, answering to the Rhætic of the Alps. His large collection of fossil fishes is now in the museum of the Bath Institute.

**Moore,** EDWARD, 1712–1757. English poet and dramatist. *Fables*, 1744; *The Gamester*, 1753.

**Moore,** GEORGE, b. ab.1850. English novelist. *A Mummer's Wife*, 1884; *Esther Waters*, 1894.

**Moore,** JOHN, M.D., 1730–1802. Scottish author. *Zeluco*, 1789. His *Works* were collected in 7 vols. 1820.

**Moore,** SIR JOHN, 1761–1809. British major-general 1801, commanding in Spain 1808; killed at Corunna; celebrated in Charles Wolfe's poem on his *Burial*.

**Moore,** THOMAS, 1779–1852. Irish poet, chiefly lyrical; pensioned 1835; tr. Anacreon, 1800; *Works of Thomas Little*, 1801; *Odes and Epistles*, 1806; *Irish Melodies*, 1807–34; *Sacred Songs*, 1816; *Lalla Rookh*, 1817; *Fudge Family*, 1818; *Loves of the Angels*, 1823. He wrote in prose *Captain Rock*, 1824; *The Epicurean*, a classical romance, 1827; *Hist. Ireland*, 1827; lives of Sheridan, 1825, Byron, 1830, and Lord E. Fitzgerald, 1831. His talent was brilliant and superficial; some of his songs are still popular.

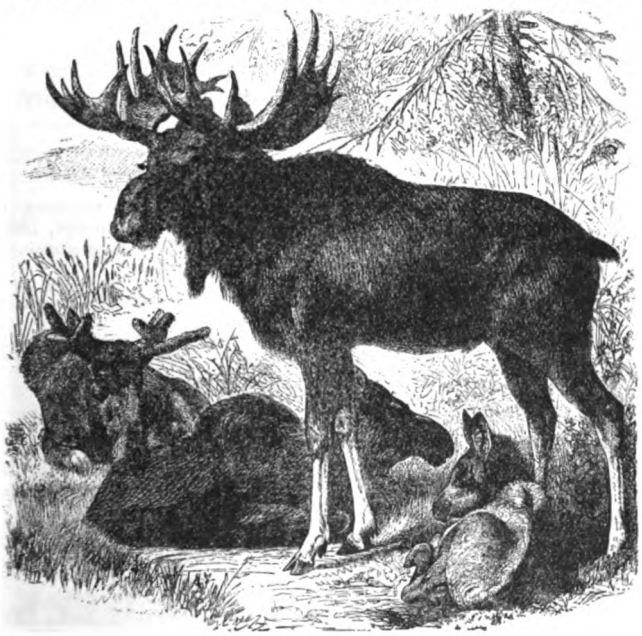
**Moore's Creek.** In N. C.; scene of a victory of Col. Coswell with 1,000 militia over 1,600 loyalists Feb. 27, 1776.

**Moor-Hen.** Small rail or gallinule of Europe, of dark olive color above and white under the tail. It nests close to bodies of water, and flies usually by night.

**Moorish Architecture.** See ARABIAN ARCHITECTURE.

**Moors.** Admixture of Carthaginians, Romans and Greeks, with an old Mauretanian base; incorporated with the Arabs. Under Tarik they invaded Spain 711 and established the Caliphate of Cordova. They were defeated by Alfonso of Leon 1144, and by Ferdinand 1232–48; founded the kingdom of Granada 1238, to defend which 200,000 came from Africa 1327 and were defeated by Alfonso 1340. Granada was taken and the Moors extirpated by Ferdinand 1492. They attained a high degree of civilization.

**Moose** (ALCES MACHLIS or PALMATUS). It ranges through n. Russia and in Canada, as far s. as Maine. It is short-bodied and long-legged, has a prominent convex nasal ridge, long ears, and two-branched palmated horns, which have a spread of 4 ft.



Moose (*Alces palmatus*).

and may weigh 70 lbs. These are not fully formed until the third year, and are cast in Dec. and renewed from April to June. The pelage consists of long, coarse hair and fine wool. The hide makes excellent leather for moccasins. They feed on shoots and leaves, the prominent upper-lip not being adapted for grazing. Their hearing is acute, and they are difficult of approach, but are most easily lured during the rutting season by sounds imitating the call of the female or of a rival male. They are in danger of becoming extinct. See ELK.

**Moosehead Lake.** In Maine, on the headwaters of the Kennebec. Area 120 sq. m.

**Moosewood.** See LEATHERWOOD.

**Moquin-Tandon,** ALFRED, 1804–1863. French botanist. *Chenopodiarum monographica enumeratio*, 1840; *Tératologie végétale*, 1841; *Botanique medicale*, 1861; *Monde de la mer*, 1865.

**Moquis.** Indians of the Shoshone family, living in PUEBLOS (q.v.) in n. Arizona. They occupy seven cities on the top of nearly inaccessible mesas (hills), and all within an area less than 20 miles in diameter. They numbered 7,000 in 1850 and only 1,600 in 1877. They are industrious agriculturists and practice irrigation.

**Mora,** JOSÉ JOAQUIN, 1784–ab.1858. Spanish author and translator; in S. America 1827–38; in England 1823–27 and 1838–43. *Hist. Arabs*, 1826; *Spanish Legends*, 1840.

**Moraes,** PRUDENTE, b. ab. 1845. Brazilian deputy 1885, Senator 1889, Pres. 1894.

**Moraes y Silva,** ANTONIO DE, 1756–1825. Brazilian judge; author of a Portuguese history, 1788–1806, and dictionary, 1789–1815.

**Moraine.** Débris of rocks brought into valley by glaciers. The Ground-Moraine consists of material beneath the ice; the Lateral-Moraine falls on the glacier from the side of its valley;

Glaciers and Moraine in Franz-Joseph Land.

the Medial-Moraine is formed by the junction of two Lateral-Moraines at the union of two glaciers; the Terminal-Moraine is composed of material dropped where the ice melts at the end of the GLACIER (q.v.)

**Moral Claim.** Form of quasi-right which one has to the benefit which comes from another person fulfilling his duty toward him; as a claim to be relieved, when in distress, by a brother.

**Moral Code.** Systematized body of principles and precepts concerning what is right and what is wrong.

**Moral Courage.** Virtue which consists in facing the pains and dangers of social disapproval in the performance of what one believes to be duty.

**Moral Cultivation,** or EDUCATION. Development of the moral sentiments and of the conscience by action, habit, thought, and outside influences.

**Morales,** CRISTOFANO. Spanish Church musician; papal singer in Rome ab.1540.

**Morales,** JUAN BAUTISTA, 1788–1856. Mexican journalist and politician; pres. Supreme Court 1850 and 1855. *El Gallo Pitagorico*, 1858.

**Moral Faculty.** Native capacity of the mind to form moral judgments.

**Moral Intuitions.** Immediate judgments as to the rightness or wrongness of actions, considered independently of the agent's own views of the moral character of his intention in the act.

**Moralities.** Form of drama succeeding the miracle-plays, in which the characters are abstract qualities, Perseverance, Will, and the like; familiar in England and France in 15th century.

**Moral Philosophy.** See ETHICS.

**Moral Principles.** Fundamental rules of human action, considered as the bases of other more definite rules; *e.g.*, those of humanity, justice, purity, order, earnestness, and moral purpose.

**Moral Reason.** Reason as it apprehends objective moral rules, recognizing that what is judged to be right by one's self must be thought to be so by all reasoning beings.

**Moral Rules.** Such laws of human action as have been recognized by the reason to be necessary to the order and progress of society and the freedom of action of individuals, and are therefore binding on the conscience.

**Moral Science.** See ETHICS.

**Moral Sentiments.** Feelings of regard or anger, awakened by observing right or wrong actions in others.

**Moran,** THOMAS, b. 1837. English-American landscape painter. His *Cañon of the Yellowstone* and *Chasm of the Colorado*, 1874–75, are in the Capitol.—His brothers, EDWARD, b. 1829, and PETER, b. 1842, are also noted artists.

**Morat.** Swiss village in canton Freiburg. Here Charles the Bold of Burgundy was defeated by the Swiss June 22, 1476, and a monument built of the bones of the vanquished; this was destroyed by the French 1798. Pop. ab. 2,400.

**Morata,** OLYMPIA (FRAU GRUNDLER), 1526–1555. Italian author. Her Latin and Greek poems were pub. 1558.

**Moratin,** NICOLAS-FERNANDEZ DE, 1737–1780. Spanish dramatist and poet, prof. in Madrid. His effort to reform and secularize the Spanish theater was carried on by his son, LEANDRO FERNANDEZ, 1760–1828, who wrote comedies, was patronized by Godoy and Joseph Bonaparte, and lived in Paris from 1814.

**Moravia.** Province of Austria, between Hungary and Bohemia, successively ruled by these and by Poland, and since 1526 by Austria. Area 8,580 sq. m.; pop., 1890, 2,276,870.

**Moravian Church,** or UNITAS FRATRUM. Revival in Saxony, 1722–35 under Count Zinzendorf, of the old Moravian or Bohemian Church, whose order (without episcopal government) it has received, eminent for simplicity, purity, and missionary zeal. Its General Synod meets at Herrnhut in Saxony. It has 3 provinces, in Germany, England and America, with ab. 33,500 members, of whom nearly 20,000 are American, besides as many in its foreign stations, served by ab. 350 missionaries.

**Moray,** EARL OF. See MURRAY.

**Morazan,** FRANCISCO, 1792–1842. Pres. of Central America 1830–38; executed by revolutionists.

**Morbidity.** Proportion of diseased persons in a community to the total number of persons in the community.

**Mordants.** Substances like alum or stannous chloride, used to impregnate cotton and other fibers, for producing colored fabrics when dyed; they fix the dye upon the fiber. See CALICO PRINTING.

**Mordecai.** In Book of Esther, cousin, guardian, and adviser of the Persian queen.

**More,** HANNAH, 1745–1833. English author, educator, and philanthropist. *Percy*, a tragedy, 1778; *Sacred Dramas*, 1782; *Cœlebs in Search of a Wife*, 1809; *Practical Piety*, 1811; *Works*, 11 vols., 1836.

**More,** HENRY, D.D., 1614–1687. Cambridge Platonist. *Philosophical Poems*, 1647; *Divine Dialogues*, 1668; *Opera Theologica*, 1675; *Opera Philosophica*, 1678.

**More,** SIR THOMAS, 1478–1535. Author of *Utopia*, 1516; knighted 1514; Privy Councillor, Treasurer 1521, Speaker of the Commons 1523, Lord Chancellor 1529–31; beheaded, after 15 months in the Tower, for refusing to acknowledge Henry VIII. as head of the Church; beatified 1886. His character was singularly pure and lovable.

**Morea.** S. part of Greece, anciently Peloponnesus.

**Moreas,** JEAN, b. 1856 at Athens. French poet and romancer.

**Moreau,** ADRIEN, b. 1843. French painter.

**Moreau,** GUSTAVE, b. 1826. French painter.

**Moreau,** HEGESIPPE, 1810–1838. French lyric poet.

**Moreau,** JACQUES JOSEPH, 1814–1884. French writer on mental disorders. *Du Hachisch*, 1845; *De l'Etiologie de l'Epilepsie*, 1854; *De la Folie neuropathique*, 1869.

**Moreau,** JEAN VICTOR, 1763–1813. French general 1794; commanding in Germany 1796, and in Italy 1798–99; distinguished in the Austrian campaign, 1800; unjustly banished 1804; in N. J. till 1813: recalled to Europe by the Czar; mortally wounded at Dresden; greatest of Napoleon's generals, and victim of his jealousy.

**Morel.** *Morchella esculenta.* Large fleshy fungus, native of the n. temperate zone, growing in woods; highly esteemed in Europe as a delicacy.

**Morel,** JEAN BAPTISTE, d. ab.1575. French Protestant, excommunicated at Geneva 1563, and later driven from the court of Navarre for his book on *Christian Discipline*, 1561, advocating Congregational polity.

**Morelia.** City of Mexico, founded as Valladolid 1541, 125 m. n.w. of Mexico City. It has a fine cathedral and an aqueduct dating from 1788. It is in the chief sugar-growing district of the state of Michoacan. Alt. 6,400 ft.; pop., 1889, 30,000.

Street View in Morelia.

**Morelos,** JOSÉ MARIA, 1765–1815. Mexican priest and patriot; leader of the revolutionists from 1811; victor in many actions; executed.

**Moreno,** MIGUEL. Spanish poet and novelist of 17th century.

**Moreri,** LOUIS, 1643–1680. French author of an immense *Historical Dictionary*, 1674 and later, tr. and enlarged by Jeremy Collier, 1701–21.

**Moresque.** See ARABESQUE.

**Moreto,** AGUSTIN, 1618–1669. Spanish dramatist.

**Moretto,** ALESSANDRO BONVICINO, 1498–1555. Venetian portrait painter of the first rank.

**Morey,** SAMUEL, 1762–1843. American inventor of sundry improvements on steam-engines and applications of steam.

**Morfit,** CAMPBELL, b. 1829. American chemist residing in England. Prof. Univ. Md. 1854–58. *Soap and Candles*, 1847; *Tanning and Currying*, 1852; *Perfumery*, 1853; *Encyclopædia of Chemistry*, 1851, with J. C. Booth.

**Morford,** HENRY, 1823–1881. American journalist, playwright, and novelist.

**Morgagni,** GIANBATTISTO, 1682–1771. Prof. of Medicine at Padua 1712; famous as an anatomist. *Opera*, 5 vols., 1765.

**Morgagni,** HYATID OF. See MÜLLERIAN DUCT.

**Morgan.** See HORSE.

**Morgan,** CONWAY LLOYD, b. 1852. Prof. Bristol, Eng., 1884. *Biology*, 1887; *Animal Life*, 1890; *Comparative Psychology*, 1894.

**Morgan,** DANIEL, 1736–1802. Brig.-gen. in American army 1780; distinguished at Cowpens 1781; commander in suppressing Pa. Whisky Insurrection 1795; M. C. 1797–99.

**Morgan,** EDWIN DENNISON, 1811–1883. Gov. of N. Y. 1858–62; U. S. Senator 1863–69. He raised and equipped 220,000 U. S. soldiers, and declined, 1865 and 1881, to be Sec. U. S. Treasury.

**Morgan,** GEORGE WASHBOURNE, 1822–1892. English-American organist, chiefly in New York. He did much to introduce and popularize classical music.

**Morgan,** GEORGE WASHINGTON, 1820–1893. U. S. Minister to Portugal 1858–61; Brig.-gen. U. S. Vols. 1861–63; M. C. from Ohio 1867–68 and 1869–73.

**Morgan,** SIR HENRY JOHN, 1637–1690. English buccaneer who preyed on the commerce of the W. Indies, ravaged the coast of Nicaragua, and captured and burned Panama. Knighted by Charles II.

**Morgan,** JAMES APPLETON, b. 1850. American Shakespearian critic and legal writer.

**Morgan,** JOHN HUNT, 1826–1864. Confederate Major-gen., captured while raiding in Ohio 1863; killed in Tenn.

**Morgan,** JOHN PIERPONT, b. 1837. American financier, prominent in connection with railways and U. S. bonds.

**Morgan,** JOHN TYLER, b. 1824. Brig.-gen. C.S.A. 1863; U. S. Senator 1877–95, re-elected 1895.

**Morgan,** LEWIS HENRY, LL.D., 1818–1881. American ethnologist. *League of the Iroquois*, 1851: *Systems of Consanguinity*, 1859; *Houses of Aborigines*, 1881.

**Morgan,** MATTHEW SOMERVILLE, 1839–1890. Anglo-American cartoonist and caricaturist.

**Morgan,** SYDNEY (OWENSON), LADY, ab. 1780–1859. Irish novelist. *Wild Irish Girl*, 1806; *O'Donnel*, 1814; *Woman and her Master*, 1840.

**Morgan,** THOMAS, d. 1743. English deist. *Moral Philosopher*, 1737–40.

**Morgan,** WILLIAM, ab. 1775–1826. Supposed victim of Freemasons, whose secrets he was expected to expose. The story was current that he had been abducted and sunk in Lake Ontario. The excitement which resulted was so great that an Anti-Masonic party was organized, which carried Vt. 1832 and elected a gov. in Pa. 1835.

**Morganatic Marriage.** In the Middle Ages, between a man of noble birth and a woman of inferior rank, which made the children legitimate, but prevented them or their mother from claiming full rights of relationship. It survives to a limited extent among European royalties.

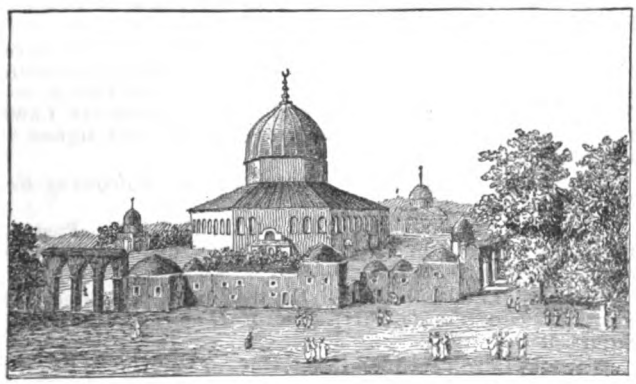
**Morgarten.** Pass in Canton Zug, Switzerland, where 15,000 Austrians under Duke Leopold were defeated by 1,400 Swiss, Nov. 15, 1315.

**Morghen,** RAPHAEL SANZIO, 1758–1833. Italian engraver, who at 20 had finished a series of seven plates of high rank, *Aurora*, after Guido; *Last Supper*, after Da Vinci; *Madonna della Seggiola*, after Raphael.

**Morgue.** Dead-house in Paris and other cities, where bodies of the unknown dead are kept for identification; more than 300 such bodies, mostly of males, are so exposed each year in Paris.

**Mori,** ARINORI, VISCOUNT, 1848–1889. Japanese Ambassador to China and England; Minister of Education 1885; murdered by a fanatic.

**Moriah.** Eastern hill of Jerusalem, on which the Temple stood, and the Mosque of Omer now stands; commonly but



Mosque of Omer in Jerusalem.

dubiously identified with the mountain on which Abraham was restrained from sacrificing his son.

**Moriarty,** JAMES JOSEPH, 1843–1887. Irish-American priest and author.

**Moriarty,** PATRICK EUGENE, 1804–1875. Superior of the Augustinians in U. S. 1840; pres. Villanova Coll., Pa. *Life of St. Augustine*, 1873.

**Morier,** JAMES, 1780–1849. English diplomatist, in Persia 1810–16; author of two books of travel, 1812–18, and of several Oriental novels, the chief being *Hajji Baba*, 1824–28; *Zohrab*, 1832; *Ayesha*, 1834; *Mirza*, 1841.

**Mörike,** EDUARD, 1804–1875. German lyric poet, novelist, and translator. *Maler Nolten*, 1832.

**Mörikofer,** JOHANN KASPAR, 1799–1877. Swiss divine, biographer of Zwingli, 1867–69. *Protestant Refugees*, 1876.

**Morillo,** PABLO, 1777–1838. Spanish General in Venezuela and Colombia 1814–20; made Count of Cartagena 1816 and Marquis of Fuentes 1822; degraded 1823. *Memorias*, 1826.

**Moringaceæ.** Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Dicotyledons*, including but 1 genus and 3 species, growing in n. Africa, warmer parts of w. Asia, and e. India.

**Moriscos.** Moors who remained in Spain after the taking of Granada, 1492.

**Morison,** GEORGE S., b. 1842. Civil engineer, designer of the Omaha, Memphis, and other large bridges; pres. American Society of Civil Engineers 1895.

**Morison,** JAMES, D.D., b. 1816. Founder of the Scottish Evangelical Union, 1843, and its prof. at Glasgow; N. T. commentator.

**Morison,** JAMES COTTER, 1831–1888. English positivist. *Life of St. Bernard*, 1863; *Service of Man*, 1886.

**Morison,** JOHN, D.D., 1749–1798. Scottish paraphraser.

**Morison,** ROBERT, 1620–1683. Scottish botanist, prof. Oxford 1669. *Plantarum Historia*, 1680.

**Morisonianism.** See EVANGELICAL UNION.

**Mörk,** JACOB HENRIK, 1714–1763. Swedish novelist.

**Morland,** GEORGE, 1763–1804. English painter of farm scenes, eminent as a colorist.

**Morley,** HENRY, LL.D., 1822–1894. Ed. *Examiner*, 1859–64; Prof. Univ. Coll., London, 1865–89; author or editor of several biographies and many books on literature.

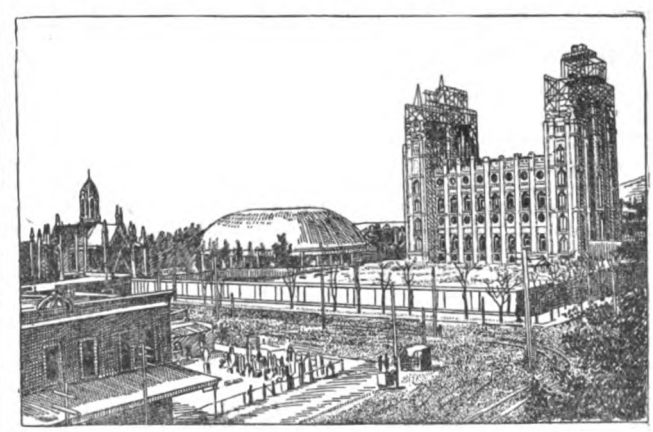
**Morley,** JOHN, LL.D., b. 1838. Ed. *Fortnightly Review*, 1867–82. M. P. since 1883, Irish Sec. 1886 and 1892; ed. *Men of Letters* series; biographer of Burke, Cobden, and others.

**Morley,** SAMUEL, 1809–1886. English philanthropist, M.P. 1868–85.

**Morley,** THOMAS, 1557–1604. English composer, especially successful in madrigals.

**Mormon,** BOOK OF. Pub. at Palmyra, N. Y., 1830; said to have been compiled by Joseph Smith and Sidney Rigdon from a MS. romance by S. Spaulding (1761–1816), stolen by Rigdon from a Pittsburg printing-office; accepted by Mormons as a divine revelation, engraved on golden plates and disclosed by an angel to Smith. It purports to describe the colonization of America by Jaredites, who came from Babel after the confusion of tongues, and its history to ab. 400, recorded by the prophet Mormon.

**Mormons.** "Church of Jesus Christ of Latter-day Saints," founded by Joseph Smith 1830; mostly polygamists, though a small fraction, headed by Joseph Smith, Jr., 1860, are monogamists. They settled at Kirtland, Ohio, 1831, then in Mo., and 1838 at Nauvoo, Ill., where Smith was killed by a mob 1844. After much persecution they migrated, led by Brigham Young, to Utah, where they founded Salt Lake City 1847, and



The Mormon Temple.

developed the region under a government of their own. Troubles occurred with other settlers ("Gentiles"), and the MOUNTAIN MEADOWS (q.v.) massacre, 1877, roused general indignation in the East. Of late years polygamy has been nominally suppressed, and a reconciliation with the U. S. Government effected. Their number, fed by accessions from Europe, is ab. 250,000.

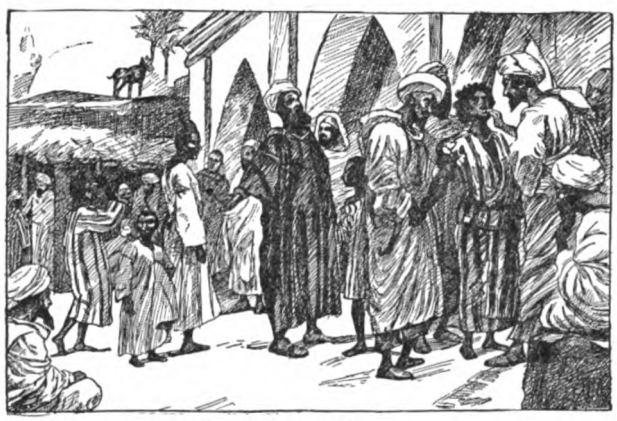
**Mornay,** PHILIPPE DE, SEIGNEUR DU PLESSIS-MARLY, 1549–1632. Huguenot soldier and author, friend of Henry IV., gov. of Saumur 1589.

**Morning-Glory.** Vines of the genus *Ipomœa*, natural family *Convolvulaceæ*, of wide geographical distribution. The commonly cultivated species is *I. purpurea*.

**Morny,** CHARLES AUGUSTE LOUIS JOSEPH, DUC DE, 1811–1865. Son of Queen Hortense; French Minister of the Interior 1848; pres. Corps Législatif from 1854; satirized in Daudet's *Nabab*.

**Moro,** ANTHONY, 1510–1568. Dutch portrait and historical painter.

**Morocco.** Empire of n. w. Africa; part of ancient Mauritania; traversed from n.e. to s.w. by the Atlas Mts., with a desert on the s. and a broken country n., stretching to the seacoast. Area ab. 220,000 sq. m. The government is an absolute monarchy, the religion Mohammedanism. The region was conquered by Vandals 429, and by Arabs ab. 660; became a



Slave Market in Morocco.

kingdom 1072, and in 1647 fell under rule of Sherifs of Tafilelet. Piracy was prohibited 1817, but not finally suppressed. Difficulties arose with France 1851–56, and with Spain 1859. Pop. ab. 6,000.000. Capital, Morocco, on n. slope of Mt. Atlas; pop. ab. 50,000.

**Morocco Leather.** See LEATHER.

**Morong,** THOMAS, 1827–1894. Curator of the herbarium of Columbia College. *Naiadaceæ of N. America*, 1893.

**Moroni,** GIOVANNI BATTISTA, ab.1510–1578. Italian portrait painter of the Venetian School, pupil and follower of Moretto.

**Morot,** AIMÉ NICHOLAS, b. 1850. French painter.

**Morpheus.** Son of sleep, and god of dreams.

**Morphine.** $C_{17}H_{17}NO(OH)_2+H_2O$. Alkaloid or base, obtained from the poppy; main constituent of opium, which contains up to 16 per cent; small crystals of very bitter taste; probably a pyridine and phenanthrene derivative; used as a soporific. See OPIUM.

**Morphogeny.** Branch of Anatomy which treats of the development of structures; divided into Ontogeny and Phylogeny. With the former are included Embryology, Embryogeny, and Embryography; with the latter Paleobiology and Paleontology or Genealogy.

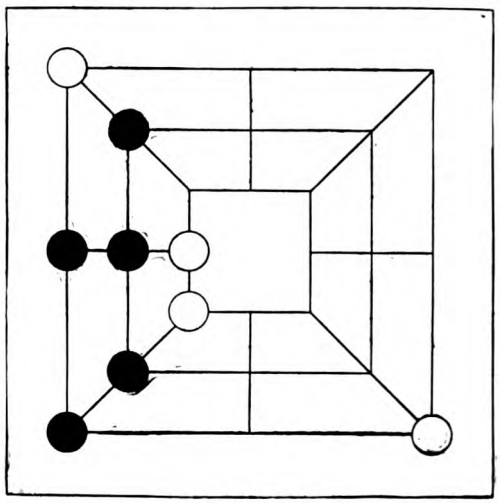
**Morphology.** Branch of Biology which treats of the structure or form of living beings, both as to development, mutual relations, and as affected by the conditions of their environment. Hæckel divides it into Anatomy, covering the structure of organisms, and Morphogeny, their development. See these terms, also ŒCOLOGY, CHOROLOGY, TAXONOMY, and ZOÖLOGY.

**Morphon.** Organism considered as a unit of structure, either as zoöids in a cormus or idorgans in a bion. The several sorts are plastid, meride, antimere, paramere, metamere, prosopen, and deme.

**Morphy,** PAUL CHARLES, 1837–1884. American chess-player.

**Morren,** CHARLES FRANÇOIS ANTOINE, 1807–1858. Prof. of Botany in Ghent. *Loisirs d'anatomie et de physiologie végétales*, 1833–37, *Dodonæa*, 1841–43; *Fuchsia*, 1849.

**Morrice,** NINE MEN'S MORRIS, or NINE MEN'S MERELS. This game is a close relation of Tit-tat-toe. It is played upon a board laid out as in annexed diagram. The object of each player is to get three men in a row; succeeding in this, he is entitled to take off one of his enemy's men. The two players have nine men each, which they take turns in placing one at a time upon the board. When all are played, they begin moving



Morrice Board.
Black on his fifth move has secured a row of three and is privileged to take off a white man.

them one space at a time. The game continues until one or the other shall have lost all but two men.

**Morrill,** DAVID LAWRENCE, LL.D., 1772–1849. U. S. Senator 1817–23; Gov. of N. H. 1824–27.

**Morrill,** JUSTIN SMITH, b. 1810. M. C. from Vt. 1855–67; U. S. Senator from 1867; framer of the tariff of 1861.

**Morrill,** LOT MYRICK, 1813–1883. Gov. of Me. 1858–60; U. S. Senator 1861–76; Sec. Treasury 1876–77.—His brother, ANSON PEASLEE, 1803–1887, was Gov. of Me. 1854–56, and M. C. 1861–63.

**Morris,** CLARA (MRS. F. C. HARRIOTT), b. ab.1846. American actress.

**Morris,** EDMUND, 1804–1874. Journalist in Pa. and N. J. *Ten Acres Enough*, 1863.

**Morris,** EDWARD DAFYDD, D.D., LL.D., b. 1825. Prof. Lane Theol. Sem. from 1867. *Theology*, 1880; *Ecclesiology*, 1885.

**Morris,** EDWARD JOY, 1815–1881. M. C. from Pa. 1843–45 and 1857–61; U. S. Minister to Turkey 1861–70; translator of books on Turkey, Norway, and Corsica.

**Morris,** GEORGE PERKINS, 1802–1864. Founder and editor, with N. P. Willis, of *N. Y. Mirror* and *Home Journal;* author of many songs, as *Woodman, Spare that Tree*.

**Morris,** GEORGE SYLVESTER, 1840–1889. Prof. Univ. Mich. 1870–80 and from 1881; critic of Kant 1882, and Hegel 1887.

**Morris,** GEORGE UPHAM, U.S.N., 1830–1875. Commander of the *Cumberland* when sunk by the *Merrimac* in Hampton Roads, Va., March 8, 1862.

**Morris,** GOUVERNEUR, 1752–1816. Delegate to Congress 1777–80, and to the convention which framed the Constitution 1787; Minister to France 1792–94; U. S. Senator 1800–3; pres. N. Y. Canal Commission from 1810.—His half-brother, LEWIS, 1726–1798, preceded him in Congress 1775–77, and signed the Declaration of Independence.

**Morris,** JOHN, 1810–1886. Compiler of a *Catalogue of British Fossils*, 1845–54.

**Morris,** JOHN GOTTLIEB, D.D., LL.D., 1803–1895. Pastor in Baltimore; writer on Lutheran doctrine, history, and biography. *Lepidoptera*, 1860–62.

**Morris,** LEWIS, b. 1834. English poet, knighted 1895. *Songs of Two Worlds*, 1871; *Epic of Hades*, 1876; *Vision of Saints*, 1890.

**Morris,** LUZON B., 1827–1895. Gov. of Conn. 1892–94.

**Morris,** RICHARD, LL.D., b. 1833. English philologist; editor of Chaucer and other early texts. *Folk-tales of India*, 1884–85.

**Morris,** ROBERT, 1734–1806. Delegate to Congress 1775–79; signer of the Declaration of Independence; Superintendent of Finance 1781–84; U. S. Senator 1789–95. During the war he sustained the public credit largely from his own resources. He met with financial reverses in old age, and died in a debtor's prison.

**Morris,** WILLIAM, 1834–1896. English poet, socialist, and house-decorator. *Defense of Guinevere*, 1858; *Jason*, 1867; *Earthly Paradise*, 1868–71; *Love is Enough*, 1873; *Sigurd*, 1877. He has tr. the *Æneid*, 1876, the *Odyssey*, 1887, and sundry

Norse tales and sagas. *Hopes and Fears for Art*, 1882; *Signs of Change*, 1888; *Socialism*, 1894.

**Morris Dance.** Said to have been borrowed from the Moors, whence its name; brought into England ab.1387, when John of Gaunt returned from Spain, where he had assisted Pedro of Castile. He said that abroad the dance was performed by young men, who danced in their shirts with ribbons, and little bells about their legs. In England there was always a boy dressed in a girl's habit, called Maid Marian. The dance was introduced into the May games and other festivals.

**Morris Island.** Off Charleston, S. C.; fortified by Confederates 1861; taken by Union forces 1863.

**Morrison,** ARTHUR, b. 1863. English author. *Tales of Mean Streets*, 1894; *Martin Hewitt*, 1895.

**Morrison,** JAMES FRANK, b. 1841. American electrician.

**Morrison,** JOSEPH CURRAN, 1816–1885. Judge of Queen's Bench, Canada, 1863; of Appeals, 1877.

**Morrison,** ROBERT, D.D., F.R.S., 1782–1834. English missionary to China 1807. He tr. the Bible 1819, prepared a Chinese grammar 1814, and dictionary 1815–23, and founded a college at Malacca 1820, transferred to Hong Kong 1845.

**Morrison,** WILLIAM RALLS, b. 1825. M.C. from Ill. 1863–65 and 1873–87; Democratic leader.

**Morristown.** Capital of Morris co., N. J.; 30 m. w. of New York; headquarters of Washington's army in the winters of 1776–77 and 1779–80. Pop., 1890, 8,156.

**Morrow,** JEREMIAH, 1771–1852. M.C. 1803–13 and 1841–43; U. S. Senator 1813–19; Gov. of Ohio 1822–26.

**Morse,** ABNER, 1793–1865. American genealogist.

**Morse,** EDWARD SYLVESTER, b. 1838. Prof. Bowdoin Coll. 1871–74, and Tokio 1877–80; director Peabody Academy of Sciences at Salem, Mass., since 1881; author of many scientific papers. *Zoölogy*, 1875; *Japanese Homes*, 1885.

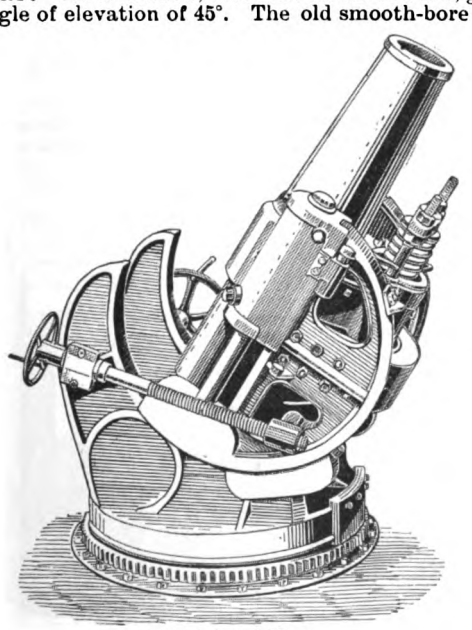
**Morse,** SAMUEL FINLEY BREESE, LL.D., 1791–1872. Inventor of the electro-magnetic telegraph 1835–44; pres. National Academy of Design 1826–42; originally a painter and sculptor. —His brothers, SIDNEY EDWARDS, 1794–1871, and RICHARD CAREY, 1795–1868, founded the *New York Observer* 1823, and edited it till 1858.—Their father, JEDIDIAH, D.D., 1761–1826, pastor at Charlestown, Mass., 1789–1820, was a writer on geography, and a pillar of orthodox Congregationalism.

**Morselli,** ENRICO AGOSTINO, b. 1852. Prof. Turin; writer on the nerves and mental maladies. *Suicide*, tr. 1882.

**Mortal Sin.** In R. C. theology, sin which extinguishes baptismal grace and incurs eternal punishment; remissible by sacramental penance, or by perfect contrition with desire of penance.

**Mortality.** Death rate, or the proportional number of individuals who, in a certain population, die in a given time. See DEATH RATE.

**Mortar.** Short cannon, intended for curved fire, generally at an angle of elevation of 45°. The old smooth-bore mortars



10-inch Canet Mortar.

were chambered and intended to fire 8 or 10-inch round shells at a low initial velocity. The modern siege and seacoast mortars are rifled cannon having elongated projectiles which can be fired with great initial velocities and give great ranges. The rifling gives them great accuracy and increases their efficiency in possible destructive effect against the enemy's vessels. In U. S. service the latest designed seacoast mortar is the 12-inch steel, weight 29,100 lbs., firing a 1,000 lb. projectile with a charge of 105 lbs. powder, giving a muzzle velocity of 1,140 ft. sec. and muzzle energy of 7,207 ft. tons.

**Mortar.** Part of a stamp-mill containing the ore to be crushed.

**Mortar,** COMMON. See LIME MORTAR.

**Mortar,** HYDRAULIC. Made of sand and hydraulic cement, and possessing the property of setting and hardening under water. Two or three parts of sand to one of cement are usually employed. The compressive strength ranges from 700 to 2,000 lbs. per sq. in. when one year old, but this is lowered with a higher proportion of sand. The tensile strength is ab. one-third the compressive. See CEMENT.

**Mortara.** Town of n. Italy, 22 m. s.w. of Milan. Scene of Austrian victory over Sardinians March 21, 1849.

**Mortara,** EDGAR. Child of Italian Jews, whose abduction by R. C. authorities, June 23, 1858, caused much excitement in England and elsewhere. He became a monk.

**Mortar Block.** Base of the mortar in a stamp-mill, on which the ore is crushed.

**Mortar Vessels.** Strongly built vessels for the purpose of carrying mortars for bombardment.

**Mortgage.** 1. Of land; a conveyance as a security, with a condition that it shall be void on a certain contingency; if the mortgagee makes default, he still has an equity of redemption which can be cut off by foreclosure. 2. Of chattels; it is of the nature of a conditional sale, and generally regulated by State statutes.

**Mortier,** ÉDOUARD ADOLPHE CASIMIR JOSEPH, 1768–1835. French general 1799, Marshal 1805, Duke of Treviso 1808; Envoy to Russia 1832; Minister of War 1834.

**Mortier,** ÉDOUARD LOUIS, 1801–1852. French naturalist, in Brazil from 1843; writer on S. America and its products. *Floræ Brasilicæ*, 1849; *Hist. Plantarum Americanarum*, 1850.

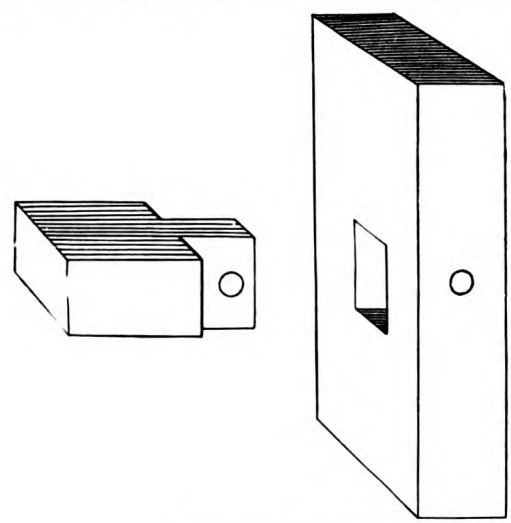
**Mortification.** See GANGRENE.

**Mortimer,** JOHN HAMILTON, 1741–1779. English historical painter.

**Mortimer,** ROGER, ab. 1287–1330. Welsh knight, paramour of Queen Isabella; leader in the deposition and atrocious murder of Edward II.; Earl of March 1327, and practically Regent; condemned and hanged by parliament.

**Mortimer's Cross.** In Herefordshire; scene of decisive victory of Duke of York, afterward Edward IV., over Pembroke and Lancastrians, Feb. 2, 1461.

**Mortise.** In Carpentry, cavity made in a member of a frame to receive the projecting tenon which is to fit into it; made by hand by boring a series of holes of the right diameter



Mortise and Tenon.

and depth and cutting them into one rectangular hole by mallet and chisel, or by machine, by rotating or by reciprocating cutters; made for single or double tenons, according to the size of the members. In heavy work the tenon is pinned into

the mortise by a wooden tree nail or by a bolt. In finer work, as in joinery, the tenon is glued and wedged.

**Mortmain.** Possession of lands by a corporation, or dead hand; subject of much legislation in Britain and in some of the U. S., notably Pa.

**Morton,** ALEXANDER, 1820–1869. Scottish-American manufacturer and improver of gold pens.

**Morton,** HENRY, b. 1836. Pres. Stevens Institute of Technology, Hoboken, N. J., since 1870; writer on chemistry and physics.

**Morton,** JAMES DOUGLAS, EARL OF, ab. 1525–1581. Fourth Earl 1553; Lord High Chancellor of Scotland 1563; partaker in the murders of Rizzio, 1566, and Darnley, 1567; Regent 1572–80; beheaded.

**Morton,** JOHN, ab. 1420–1500. Bp. of Ely 1478; Abp. of Canterbury and Lord Chancellor 1486; cardinal 1493.

**Morton,** JOHN, 1724–1777. Judge in Pa. 1771; delegate to Congress 1775–76; signer of the Declaration of Independence.

**Morton,** LEVI PARSONS, LL.D., b. 1824. M. C. 1879–81; U. S. Minister to France 1881–85; Vice-Pres. 1889–93; Gov. of N. Y. 1895–96.

**Morton,** NATHANIEL, 1613–1685. Sec. of Plymouth, Mass., from 1647; author of *New England's Memorial*, 1669, reprinted 1826 and 1855.—His father, GEORGE, 1585-ab.1628, emigrated 1620, and pub. a *Relation* of the settlement at Plymouth, 1622.

**Morton,** OLIVER PERRY, 1823–1877. Gov. of Indiana 1861–67; active in raising and equipping troops; U. S. Senator from 1877; Republican leader.

**Morton,** SAMUEL GEORGE, M.D., 1799–1851. Prof. Pa. Coll. 1839–43; gatherer of a unique collection of skulls, now in Phila. Academy of Natural Sciences. *Crania Americana*, 1839; *Crania Egyptica*, 1844.—His son, JAMES ST. CLAIR, U.S.A., 1829–1864, Brig.-gen. U. S. Vols. 1862, chief-engineer Army of the Cumberland 1862, and 9th corps, Va., 1864, was killed at Petersburg. *Fortifications*, 1857–58.—His brother, THOMAS GEORGE, M.D., b. 1835, is a noted surgeon. *Transfusion of Blood*, 1877–87.

**Morton,** THOMAS, ab.1575–1646. English lawyer who emigrated 1622, and again 1625, settling at Mount Wollaston in what is now Braintree, Mass. The Plymouth people sent him back to England 1626 for too much frivolity on May-day. He returned 1627, was again sent home, and his house demolished 1630. In 1632 he pub. *New England Canaan*, a satirical account of the colony, which so displeased the settlers that when he came again, 1643, they put him in prison. He died in Maine.

**Morton,** THOMAS, 1764–1838. English playwright.—His son, JOHN MADISON, b. 1811, wrote *Box and Cox*, 1847, and many other farces.

**Morton,** WILLIAM THOMAS GREEN, 1819–1868. Boston dentist, one of the discoverers of ANÆSTHESIA (q.v.) by sulphuric ether. He obtained English and American patents 1846, but his claim, though generally admitted by physicians, was vehemently contested. See JACKSON, CHARLES T., and WELLS, HORACE.

**Mortuary.** Building for reception of corpses before interment; first opened 1771 in Austria.

**Morula.** Sphere of cells, resembling a mulberry, resulting from the cell multiplication or segmentation of an ovum; first stage in embryonic development.

**Morungen,** HEINRICH VON. Minnesinger of 13th cent.

**Mosaic Gold.** Crystalline variety of STANNIC SULPHIDE (q.v.).

**Mosaics.** Pictures made of small cubes of colored stone or glass. The former material was preferred in antiquity, the latter in Christian art. The ancient were also more generally used for pavements, the Christian for church walls. There are many fine antique mosaics in Rome and Naples, the most famous in Naples being the *Battle of Issus* from Pompeii, the best in Rome the *Drinking Doves* in the Capitol Museum. The walls of early churches were decorated with glass mosaics having blue or gold backgrounds; the latter soon became universal. Byzantine workmen were employed wherever these decorations were used. The most splendid Christian mosaics are the 6th century figure of Christ in the Apse of Santi Cosma and Damiano on the Roman forum, and several in Ravenna; although St. Mark's at Venice gives the best impression of a completely decorated building. The art declined wholly after 1300, and the later imitations of oil paintings in St. Peter's are inferior as regards decorative results. The best survival of ancient methods is found in Roman jewelry. The art has how-

Mosaic of the 11th Century in the Atrium of St. Mark's.

ever been lately revived for wall decoration, in harmony with Byzantine and ancient methods.

**Mosasaurus.** Cretaceous marine saurian, having a body covered with overlapping bony plates and two rows of formidable teeth along the roof of the mouth, besides saurian teeth in the jaws; probably allied to modern snakes. The original specimen of this fossil reptile, after several changes of ownership, now rests in the Jardin des Plantes at Paris.

**Mosaylima,** 7th cent. Arabian prophet, rival of Mohammed; defeated and slain in battle with Khalid.

**Mosby,** JOHN SINGLETON, b. 1833. Leader of Confederate guerrillas 1863–65; U. S. Consul at Hong Kong 1878–85. *War Reminiscences*, 1887.

**Moscheles,** IGNAZ, 1794–1870. German pianist, teacher, and composer; favored by Beethoven, who intrusted him with the arrangement of *Fidèlio* for the pianoforte. Mendelssohn called him to Leipzig on the foundation of the Conservatory of Music 1846. His 142 compositions, chiefly for pianoforte, include 7 concertos.

**Moschidæ.** Family of *Pecora*, including the MUSK DEER (q.v.), sometimes considered with the true Deer (*Cervidæ*), and characterized by the male possessing a musk gland posterior to the navel. The dentition is similar to that of the *Tragulina*. Habitat is central Asia to Siberia. They resemble true deer in having a cotyledonary placenta and in that the young are spotted.

**Moschus,** 3d cent. B.C. Sicilian bucolic poet, some of whose shorter productions are extant.

**Moscoso,** LUIS DE, 1505–1561. Spanish officer in America; lieutenant and successor of De Soto, whose party he led to Mexico 1542–43.

**Moscow.** One of the principal cities of Russia and its capital 1238–1711; on both banks of the river Moskwa. It is

Church of St. Vasiliy and Group of Minin, Moscow.

irregularly laid out, contains many fine buildings, particularly the KREMLIN (q.v.) palaces, has a celebrated university,

numerous scientific and literary institutions, and a large internal trade. It was founded 1147, ravaged by Timur 1382, by Tartars 1451 and 1477, by Ladislas of Poland 1611; entered by Napoleon Sept. 14, 1812; fired Sept. 15, and city mostly destroyed; evacuated by the French Oct. 19. Pop., 1890, 822,397.

**Moscow,** UNIVERSITY OF. Founded 1755; has four faculties, about 3,400 students, and a library of 170,000 vols. The library of the Museum contains 300,000 vols.

**Moseley,** HENRY, D.D., F.R.S., 1802–1872. King's Coll., London, 1831–45; Canon of Bristol 1873. *Engineering and Architecture*, 1842; *Astronomy*, 1847.

**Moselle.** Branch of the Rhine, rising in e. France, and flowing n. and n.e. to Coblentz. Length 330 m.

**Moselle Wines.** Produced in the valley of the same name in Germany; delicate, and have a remarkably developed and pleasant bouquet, but with little body, and hence do not keep for any length of time. An analysis of Brauneberg gave alcohol 9.4 per cent, 7.6 grs. tartaric acid per oz., sugar none.

**Mosen,** JULIUS, 1803–1867. German dramatist and poet. *Ahasuerus*, 1838.

**Mosenthal,** JOSEPH, 1834–1896. German-American organist and composer.

**Mosenthal,** SALOMON HERMANN, 1821–1877. German dramatist. His *Deborah*, 1850, has been tr. as *Leah*.

**Moser,** GUSTAV VON, b. 1825. German author of comedies and farces.

**Möser,** JUSTUS, 1720–1794. Historian of Osnabrück 1768. *Phantasien*, 1774; *Works*, 1842–43.

**Moser,** MARY (MRS. LLOYD), d. 1819. English flower painter.

**Moses.** Law-giver of the Israelites, and instrument of their deliverance from Egypt.

**Moses Chorenensis,** ab. 410–480. Armenian bishop and historian.

**Mosheim,** JOHANN LORENZ VON, D.D., 1694–1755. Prof. Helmstädt 1723, Göttingen 1747. His Latin *Ch. History*, 1726–41, has been widely read in two English versions, 1764 and 1832. *Commentaries*, 1753, tr. 1832.

**Moskwa,** or MOSKOWA. River of central Russia, tributary to the Oka and Volga. See BORODINO.

**Mosque.** Mohammedan place of worship. Turkish mosques are distinguished for the size and elevation of their cupolas. Each mosque is provided with a minaret, and commonly with a fountain of water, with numerous basins for ablutions. See BYZANTINE ARCHITECTURE.

**Mosquera,** RUY GARCIA, 1501–1555. Spanish soldier, associated with S. Cabot in exploring the Plata and colonizing Paraguay.

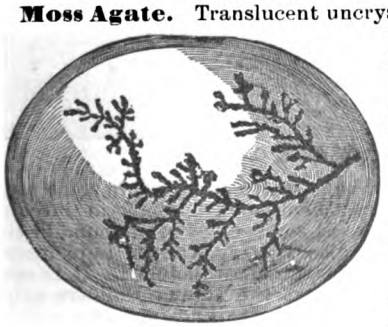
**Mosquera,** TOMÁS CIPRIANO DE, 1798–1878. Pres. of New Granada 1845–48, and of Colombia 1861–64 and 1866–67; biographer of Bolivar, 1853.

**Mosquito.** See NEMOCERA.

**Mosquito Coast,** or MOSQUITIA. Strip on e. coast of Nicaragua, inhabited by a people believed to have descended from runaway slaves and native Indian women. England exercised a protectorate over it most of the time 1660–1850, when by the Clayton-Bulwer treaty she resigned all claim. The Mosquitoes, once able to muster 40,000 warriors, now number but ab. 10,000. Nicaragua claims the sovereignty.

**Moss,** BLACK. *Tillandsia usneoides*. Epiphytic plant of the natural family *Bromeliaceæ*, found on trees throughout tropical America, and extending northward into Va.; known also as Spanish Moss, Long Moss, and Florida Moss.

**Moss Agate.** Translucent uncrystallized quartz, containing small granular impurities arranged in moss-like forms, but not revealing under the microscope any evidence of vegetable structure; mocha stone.



Moss Agate.

**Mosses.** See MUSCI.

**Mosso,** ANGELO, b. 1846. Prof. Turin 1876; writer on physiology.

**Moss-Pink.** *Phlox subulata*. Tufted, purple-flowered herb of the natural family *Polemoniaceæ*, native of e. N. America; often cultivated; known as Ground Pink.

**Mostar.** Capital of Herzegovina, 47 m. s.w. of Sarajevo, noted for its wines and grapes. Pop. 12,700.

**Most Holy Place.** Inner apartment of the Hebrew Tabernacle or Temple, separated by a curtain from the Holy Place, and containing in the First Temple the Ark of the Covenant, overshadowed by the gilded Cherubim; the Second Temple empty; accessible only to the Highpriest, and to him only once a year, on the Day of Atonement.

**Most Reverend.** Title especially of an archbishop, or cardinal, the latter being also Most Eminent; borne also by the Bishop of Meath.

**Mosul.** Town on w. bank of the Tigris, opposite the ruins of Nineveh; known from 636; once prosperous and a Christian center, now decayed. Pop. ab. 57,000.

**Moszkowski,** MORITZ, b. 1854 at Breslau. Pianist and composer, chiefly of salon pieces and a symphony, *Jeanne d'Arc*.

**Motanabbi,** or **Motenebbi,** ABUL TAYYIB AHMEE IBN AL-HOSAIN OF CUFA, 915–965. Arab poet of the later period, who lived at the courts of several princes.

**Motasalis.** Mussulman heretical sect, founded after the prophet's death, which taught that the Koran was created and not eternal, and that God's providence left man absolutely free.

**Mote.** Straw filled with gunpowder for use in igniting a blasting charge.

**Motet.** POLYPHONIC (q.v.) composition for voices, with Biblical text, but without instrumental accompaniment.

**Moth,** MATTHIAS, ab. 1642–1719. Chancellor of Denmark 1684–99; author of an immense Danish dictionary, preserved in the royal library at Copenhagen.

**Mother Carey's Chickens.** See STORMY PETRELS.

**Mother-Cells.** Those from which new cells are produced by division.

**Mothergate.** Main road in a coal-mine.

**Mother Goose's Melodies.** This was first issued by John Newbery, of London, ab. 1760, and was republished by Isaiah Thomas, Worcester, Mass., ab. 1785. Newbery was a printer of books for children. There is no satisfactory evidence that the songs were written by a person named Goose. It is probably a collection of nursery rhymes of the times.

**Motherlode.** Lode in a mining district; that occupying the principal fissure and with which other lodes of minor importance are more or less directly connected.

**Mother of Pearl.** Shells of the pearl-oyster, found in tropical seas; used for knife-handles, buttons, etc. See PEARL.

**Motherwell,** WILLIAM, 1797–1835. Scottish lyric poet, ed. *Minstrelsy*, 1827.

**Motherwort.** *Leonurus cardiaca*. Coarse herb of the Mint family, native of Europe, introduced as a weed into N. America.

Motherwort.

**Moths.** See LEPIDOPTERA.

**Motif.** Subject on which a musical movement depends.

**Motion.** Continuous displacement of one point or body relatively to another, either by a change in the length of the line joining them, or in the angular position of that line, or in both. In the first case the motion is a translation, in the second a rotation, in the third a helical motion. Motion may be absolute as well as relative.

**Motion,** IN ANIMALS. See MECHANICS, ANIMAL.

**Motion of Stars** IN THE LINE OF SIGHT. Motion toward or away from the earth, shown by displacement of the lines of the spectrum, toward the violet end if approaching, toward the red end if receding; thus detected in many stars.

**Motion of Stars,** PROPER. Star's own motion in space. It is probable that all stars are in motion, though on account of their great distance it usually requires many years for it to become appreciable. The actual motion of a few stars has been found to be very rapid.

**Motive.** Such an object of desire as impels to an exertion of will and of action. See VOLITION.

**Motives to Action.** Desires which lead to an awakening of intention and an exercise of will.

**Motivity.** Ratio of the available energy in the universe to the total energy. The limit of this ratio as time increases indefinitely is clearly zero.

**Motley,** JOHN LOTHROP, LL.D., D.C.L., 1814–1877. American historian. His *Rise of the Dutch Republic*, 3 vols., 1856, is a brilliant work of great value and importance. Its subject was continued in *History of the United Netherlands*, 4 vols., 1860–68, and *Life of Barneveld*, 1874. He was U. S. Minister to Austria 1861–66, and to England 1869–70. His early novels, *Morton's Hope*, 1839, and *Merrymount*, 1849, won little attention. *Correspondence*, 1889.

**Motmot.** New World tropical picarian bird, with serrated bill, middle tail feathers much the longest, and vanes denuded from outer half of the shaft, except at the tip.

Motmot (*Prionites brasiliensis*).

**Motograph.** Device based on the principle discovered by Edison 1873, that the friction between two surfaces is varied by the passage of an electric current between them. In the motograph telephone and relay, a rotating chalk cylinder tends to pull a palladium-faced spring, which rests upon it, in the direction of rotation. But when an electric current passes through the surfaces of contact, the friction is diminished and the spring slides backward over the cylinder. If the current be intermittent, a series of to-and-fro movements of the spring will result, which may be made to work a local circuit or the diaphragm of a telephone.

**Motoori,** MORINAGA, 1730–1801. Japanese historian.

**Motor.** Machine for utilizing one of the elementary forces, so that it may produce continuous motion and supply power for industrial purposes. There are, therefore, steam, gas, and caloric motors using the force of heat, wind and water motors utilizing the force of gravity, animal powers, and machinery driven by weights or springs, in which muscular or vital force is expended direct or after being stored, and the electromotors, which utilize the force of electric currents. The term prime-mover is synonymous with motor. Some writers restrict the term motor to the elementary force itself, but the other sense, here used, is the more usual.

**Motor,** ELECTRIC. The action of the electric motor depends on the complete reversibility of the dynamo electric machine. It was not till 1873, after the substitution of electro-magnets for permanent ones in electric generators, that this principle was fully recognized at the Vienna exhibition. An electric motor, therefore, is a dynamo employed to convert electric energy into mechanical energy. The motor made by the Edison General Electric Company has a high efficiency and is widely used. A coil through which a current is passing, and which is capable of rotating about a diameter as an axis, experiences, when placed in a magnetic field, a force tending to rotate it so as to make the flow of magnetic force through it a maximum. The work done per second, in thus rotating it, is the product of the moment of the rotating couple by the speed. This mechanical activity is derived from the electric energy supplied to the motor, and so it is the more nearly equal to the electrical work expended in the same time, as the motor is more efficient. Two laws of efficiency may be here mentioned: the first is Jacobi's law of maximum rate of work; for the maximum rate of work the motor must run at such a speed as to reduce the current to one-half that passing when the motor is at rest, or the efficiency is only 50 per cent when the motor does work at the maximum rate. Siemens, however, pointed out theoretically that a higher efficiency may be obtained from a motor if it be made to work at less than its maximum rate. True, it does less work, but the amount of work done upon it is also lessened, and to a greater extent, so that the efficiency is higher. The ratio of the work done by the motor to the work done upon it is simply the ratio of the counter electromotive force developed by the motor itself to that supplied to it by the generator. So that by increasing this counter electromotive force, either by increasing the strength of the field or the speed of rotation, the efficiency may be made very nearly unity, exactly as is the case with the generating dynamo; this is the second law. Electric motors are made in many forms and are used for a great variety of purposes. In cities they are usually placed or supplied by powerful dynamos at central power houses. The convenience and economy of the electric motor have led to its common use in operating many forms of light machinery such as fans, sewing machines, lathes, printing presses, etc. On a larger scale, it is used for running elevators and street cars, and may soon displace the steam locomotive on railways.

**Mott,** LUCRETIA (COFFIN), 1793–1880. Quaker preacher and philanthropist of Philadelphia.

**Mott,** VALENTINE, M.D., LL.D., 1785–1865. Prof. of Surgery in New York from 1811; eminent as operator, teacher, and inventor. *Cliniques*, 1860.

**Motteville,** MME. FRANCES BERTRAND DE, 1621–1689. French writer of memoirs.

**Motto.** Word or words, usually expressing a moral sentiment, to accompany a crest or coat of arms.

**Mouchez,** ERNEST AMÉDÉE BARTHÉLÉMY, 1821–1892. French rear admiral; Director of the Paris Observatory 1878. It was largely through his efforts that the great photographic survey of the heavens now in progress was undertaken.

**Mould.** Large number of minute *Fungi*, saprophytic on various organic substances.

**Moulton,** MRS. LOUISE (CHANDLER), b. 1835, m. 1855. American poet and story-writer.

**Moultrie,** GERARD, 1829–1885. English hymnist, as was also his father, JOHN, 1799–1874, rector of Rugby from 1825.

**Moultrie,** WILLIAM, 1731–1805. American revolutionary officer, defender of the fort on Sullivan's Island, near Charleston, 1776; prisoner 1780–82; Major-gen. 1782; Gov. of S. C. 1785 and 1794–96. *Memoirs of the Revolution*, 1802.

**Mound-Builders.** Extinct American race of mysterious origin and unknown history. Their great mounds reach from the Great Lakes to the Gulf States and from the Alleghanies to the Rocky Mts. The Grave Creek mound in W. Va. is 70 ft. high and 300 ft. in diameter. It was a burial mound, as all the circular ones appear to have been. Others were fortifications of vast extent. Still others, in the shape of animals, like the serpent mound near Bush Creek, Ohio, were undoubtedly

Mound at Marietta, Ohio.

representative of religious belief and connected in some way with animal worship. Authenticated alphabetic inscriptions on stone tablets have in some cases been found in the mounds; excavations yield also pottery, copper implements and ornaments, and stone tools, obsidian included. It is suggested by James Fergusson that the Mound Builders came from N. Asia, where similar mounds are known.

**Mountain.** Abrupt elevation of land, differing from a hill only in size. Mountains occur in ranges or groups, or are isolated. Ranges are often grouped into systems, which gen-

erally stand upon plateaus, their bases being commonly at considerable elevation above sea level. A mountain is generally the net result of two opposing agencies, that of elevation and that of erosion, which cuts down and degrades. Raised as a simple anticlinal or monoclinal, erosion reduces the elevation, and carves the mass into peaks, spurs, passes, and gaps. The upper limit of forests upon mountains varies with the latitude and with the general elevation of the adjoining country. It corresponds nearly with the isotherm of 32 F. The height of the snow-line depends upon the same factors. See MOUNTAIN STRUCTURE.

**Mountain.** Party in French Revolution. See MONTAGNARDS.

**Mountain Artillery.** The Hotchkiss mountain rifle is the only gun of this class in the U. S. service. It is made light (160 lbs.), so that it may be carried on mule-back; its carriage weighs 220 lbs.; two men can pack, unpack and mount it. The gun, a single-forged piece of steel, is breech-loading, having a caliber 1.65 inches; the shell weighs 2 lbs. 10 oz., the charge 5¼ oz. of powder; initial velocity 1,275 ft. sec.

**Mountain-Ash.** Small trees of the genus *Sorbus*, natural family *Rosaceæ*, bearing pinnate leaves and showy clusters of red fruit, natives of the n. temperate zone. In Europe the superstitious peasants use the wood for divining rods and to drive away evil spirits.

**Mountain Cork.** Variety of amphibole, related to asbestus and light enough to float on water.

**Mountain Leather.** Variety of amphibole, in sheets resembling leather in flexibility and consistency.

**Mountain Limestone.** Bed usually richly fossiliferous, and forming the base of the Carboniferous system in N. America, where it is frequently called the Sub-Carboniferous Limestone, and in Europe. See CARBONIFEROUS.

**Mountain Meadows.** In Utah; scene of a massacre, Sept. 18, 1857, of ab. 150 immigrants by Indians, instigated or led by Mormons. One man was executed 1877 for his part in it.

**Mountain Railways.** In these, heavy grades and sharp curves are necessary, and often rack rails or cables are required to effect the ascent of the train. On a grade of 4 per cent, *i.e.* 4 ft. rise in 100 ft. of horizontal distance, an ordinary locomotive can ascend only with difficulty even with a light load. Planes with stationary engines, up which cars are pulled by a band or cable, have been frequently built. That at Mauch Chunk, Pa., on the "Switchback," has a length of 2,320 ft. and

Cable Railway, 60 per cent gradient, Monte Salvatore, Switz.

a rise of 664 ft., the grade being 30 per cent. The Mexican Railway rises 6,412 ft. in 54 m., with an average grade of 2¼ per cent (maximum 4 per cent), has 16 tunnels, and curves of 325 ft. radius. Numerous roads for tourist travel in Switzerland have rack rails or cables, and grades of 40 to 60 per cent; these usually have the narrow gauge of one meter (3.28 ft.). The Otis Elevating Railway in the Catskills is the longest cable incline in the U. S., rising 1,630 ft. in 7,000 ft., a grade of 34 per cent. The longest in the world is that up Mt. Vesuvius in Italy, which is 10,500 ft., with a maximum grade of 63 per cent. See INCLINED PLANE.

**Mountain Rains.** Caused by movement of winds rising up over mountains; so called by Abercromby 1887.

**Mountain Structure.** The geology of this, or Orography, including the origin and formation of mountain masses, has proved an intricate problem, of which a few factors only can be given here. For the most part, mountains are the harder portions of the strata left in relief by the erosion of the softer. In some these strata are horizontal; in others the dips are all in one direction (monoclinal); in a few they dip both ways from the axis; occasionally the dip is quaquaversal, or in all directions from a central point; more frequently the strata are synclinal, dipping in to the axis; and sometimes they are inverted, giving a fan-shaped structure. So great a variation must, it would seem, be due to more than one cause, and theories have been many and various. Omitting the more fanciful, we find the others chiefly based on two principles, the secular contraction of the earth, and the changes ensuing on the formation of massive sedimentary deposits. That the first may be a real cause it is impossible to deny. The shrinking of the cooling nucleus from the cold crust must cause a certain amount of crumpling, and out of the ridges thus formed mountains may be carved by erosion. But physicists deny its sufficiency, and maintain that no allowable amount of contraction can account for the mountain masses of the globe. A modification of this theory calls to its aid a certain additional amount, due to the slowing down of the earth's rotation and the consequent diminution of the centrifugal force. But this is of little avail except near the equator.

The second theory is based on the expansion of thick masses of sediment by the heat that enters them from below, which is estimated by some to be great enough to cause folding of the strata. This theory has lately been worked out fully by T. M. Reade. Like the other, it is open to serious objections, and it is impossible to admit that either is firmly established. In any case, it must be borne in mind that these theories merely supply the folded strata. Existing mountains have almost all been carved from these by the secondary action of water, and are in most cases but fragments of the original arches, anticlinal and quaquaversal mountains being comparatively rare.

The stability of mountain ranges is an equally difficult problem. It is uncertain if they are borne up by the rigidity of the solid material beneath them, or are floating by their levity on a semi-fluid central mass. The results of experiments are thus far indecisive. The amount of deviation of the plumb line from the perpendicular, caused by the mass of the Himalayas, indicates that these mountains are of less specific gravity than the average crust; and a series of experiments with a pendulum lately made across N. America give partly similar results. The safest conclusion is probably at present that great mountain ranges are in equilibrium on account of their specific gravity, but that smaller inequalities may in some cases at least be maintained by the rigidity of their material.

**Mount Crawford,** (VA.), BATTLE OF. See PIEDMONT.

**Mount Desert.** Island off coast of Maine, 14 m. by 7; settled by French 1608, by British 1761; summer resort. Pop., 1890, 5,337. Bar Harbor is its chief place.

**Mount Holyoke Seminary.** Founded 1836 by MARY LYON (q.v.), at S. Hadley, Mass., for young women; enlarged 1893 as a college. It had, 1896, 35 teachers and 331 students, 16,000 vols., and has sent out many missionaries.

**Mount-Stephen,** GEORGE STEPHEN, LORD, b. 1829 in Scotland. Pres. Canadian Pacific R. R. 1881–88; Baronet 1886, Baron 1891.

**Mount Vernon.** City of Westchester co., N.Y., on the Bronx; suburb of New York. Pop., 1890, 10,830.

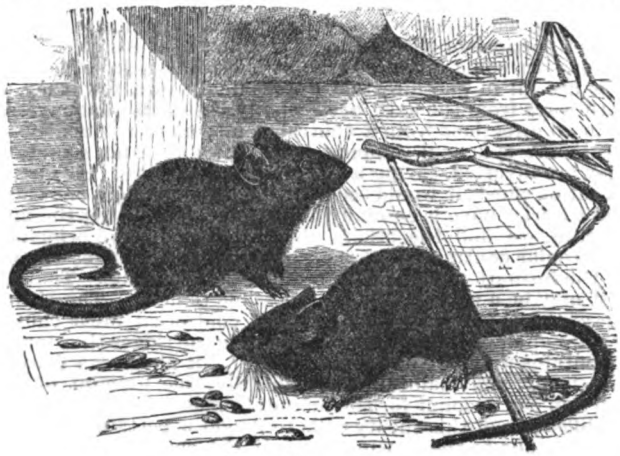
**Mount Vernon.** In Fairfax co., Va., on the Potomac, 15 m. s. of Washington, D.C.; residence and burial-place of Gen. Washington; owned and kept by a Ladies' Association since 1858.

**Mourning.** Official or conventional expression of grief. The mourning rites among savages is often horrible, consisting of the mutilation of the body. The Hebrews tore their garments, cut the hair and beard, and went bare-headed and barefooted. The period of mourning was 7 days, but for Moses and Aaron it was 30 days. In Europe and America, the mourning color is black; in Turkey, violet; in China, white; in Egypt, yellow.

**Mousa-ben-Noseir,** ab. 660-718. Arabian general, Viceroy of Egypt 703.

**Mouse.** The domestic mouse is *Mus musculus*. This genus has over 100 species, including a third of the family *Muridæ*. The genus *Hesperomys* of America has cheek pouches, and includes the white-bellied and the white-footed mice (length ab. 4 in., tail 3), the Golden mouse, Rice-field mouse (length 4 in., tail 5 in.); *Ochetodon* includes the small Harvest mice (2 in. long). Besides these are the Voles or Meadow mice (*Arvicola*) that burrow in bogs, have short legs, blunt muzzles, and are rather slow in

movement. They are very prolific. The red-backed mouse has 4 litters a year, of 4 to 8 young each. Some mice, *e.g.*



Mouse (*Mus musculus*).

the sub-family *Murinæ*, have rooted molars; others have rootless molars.

**Mouse-Ear.** Low herbs of the genus *Myosotis*, of the Borage family, natives of the n. temperate zone.

**Mouse-Tail.** *Myosurus minimus.* Low herb of the Buttercup family, native of the n. temperate zone.

**Mousquetaires.** Mounted bodyguard of the kings of France from 1622–1815.

**Mouth,** Diseases of. Principally, the different forms of inflammation, acute, aplethus, ulcerative, parasitic, gangrenous, and mercureal stomatitis; epulis; gumboil; ranula; salivary calculus, and salivary fistula.

**Movable Accent.** In Germanic words the accent, once movable, is now generally fixed on the root-syllable, whereas in Greek and other ancient tongues the accent changed with different forms of the same word.

**Movement.** Physiologically, change of position resulting from the action of muscles. We may distinguish broadly three kinds of movement: reflex, automatic, and voluntary, the last being in reality an extreme form of automatism. Movements are also classified as *active*, those performed by the subject himself, and *passive*, those communicated to the body by others. Psychologically, a movement is the natural and immediate result of feeling, or in the voluntary life the natural reaction to a cognition with its emotional tone is a conative act expressed in movement or its inhibition. See Reflex Action and Automatic Action.

**Movers,** Franz Karl, 1806–1856. German Oriental scholar, best known for investigations regarding the language and antiquities of the Phœnicians.

**Mowatt,** Anna Cora (Ogden). 1819–1870. American dramatist and novelist, on the stage 1845–54. *Evelyn*, 1845; *Autobiography*, 1854. She became Mrs. W. F. Ritchie 1854.

**Mower.** Horse-power machine, used for cutting grass or grain crops that are harvested without binding. Mowers came into general use ab. 1850, and have since led to the introduction of reapers and binders, as well as power machines for other harvesting operations, as raking, loading, stacking.

**Moya de Contreras,** Pedro, 1520–1591. Abp. of Mexico 1574; acting viceroy 1584–85.

**Mozambique Channel.** Between Madagascar and the mainland of Africa; 1,000 m. long.

**Mozarabic Liturgy.** Ancient service-book of high repute, similar to the Gallican; used in Spain ab. 500–1070, and at Toledo from 1502.

**Mozarabs.** Christians in Spain under Moslem rule.

**Mozart,** Wolfgang Amadeus, 1756–1791. Perhaps the most generously endowed of musicians. His precocity was so great that his father took him at six upon a concert tour, with his sister, who was eleven, to Munich and Vienna. A second tour, 1763–66, extended to Paris and London, where original compositions (sonatas and short symphonies) were produced, and some of them published. At ten he composed his first oratorio; at thirteen his first opera, *La Finta semplice*, was performed in his native town, Salzburg, though written on a commission from Vienna 1767. He was appointed archiepiscopal concertmaster in Salzburg 1769, and soon after visited Italy, where he gave many concerts, composed an opera, *Mitridate*, performed at Milan 1770, was made Knight of the Golden Spur by the Pope, passed the examinations, was elected member of the Philharmonic Academy in Bologna, and wrote masses, symphonies, concertos, etc. In 1779 he was appointed Court Organist, and soon was commissioned to write an opera for Munich. The result was *Idomeneo*, produced 1781. Despairing of advancement, he went to Vienna and there produced his masterpieces, but not till 1789 did the emperor appoint him to a position, Imperial Chamber composer, in no way commensurate with his genius. In Vienna he produced his masterpieces, which still live without contemporary rivals except the

Wolfgang Amadeus Mozart.

operas of Gluck; viz., *Die Entführung aus dem Serail*, 1781; *Le Nozze di Figaro*, 1785; *Don Giovanni* (for Prague), 1787; *Cosi fan tutte*, 1790; *La Clemenza di Tito*, 1791, and *Die Zauberflöte*, 1791. His last composition, the Requiem Mass, was written on his deathbed. Among his voluminous compositions, besides his operas, are 15 masses, 41 symphonies, 7 string quintets, 26 string quartets, 5 pianoforte sonatas for four hands, 17 sonatas for two hands, and 34 songs with pianoforte accompaniment.

**Mozley,** James Bowling, D.D., 1813–1878. Prof. Oxford 1871. *Predestination*, 1855; *Baptismal Regeneration*, 1856; *Miracles*, 1865.—His brother, Thomas, pub. *Reminiscences*, 1882–85.

**M'Pongwe.** Tribe of Negroes of w. Equatorial Africa. The man is ambitious to gain property in wives, etc., and social position. Then he becomes suspicious, and has his wives eat of each dish before he partakes. Every death is laid to the door of some poisoner, who is tested by being given poison to drink, if he vomits he is innocent. The father has supreme control of his family, but he is not brutal; serfs are treated the same as sons. Kings are chosen by acclamation.

**Msket,** or Mtskheta. Russian village, 13 m. n.w. of Tiflis, and probably one of the oldest inhabited places in the Caucasus. It was the residence of the Georgian kings of the 4th century, and contains an old library.

**Mucedin.** Substance related to vegetable gelatin.

**Mucic Acid.** $C_4H_4(OH)_4(COOH)_2$. Isomeric with saccharic acid; crystalline powder, slightly soluble in water; made by oxidizing sugar of milk with nitric acid.

**Mucilage.** Solution of vegetable gums or some other substance having adhesive properties. An antiseptic, such as oil of cloves, is added to prevent fermentation. Dextrin is used on postage-stamps; but, being slightly hygroscopic, it causes them to stick in damp weather.

**Mucilage-Cells.** Cells whose walls have undergone the mucilaginous modification, or whose contents are themselves of this nature.

**Muck.** See Peat.

**Muckers.** Perfectionist or Antinomian sect founded in Germany 1835; its leaders were soon deposed from the ministry. It was revived by colonists in Brazil, and suppressed 1874.

**Mucoraceæ.** Family of *Fungi*, of the order *Mucorini* and sub-class *Phycomycetes*.

**Mucorini.** Order of *Fungi*, of the sub-class *Zygomycetes*, including many species commonly called Moulds, saprophytic on various organic substances.

**Mucous Membranes.** Moist glandular linings of the internal cavities and organs of the body exposed or communicating with the air. There are three distinct tracts, the ali-

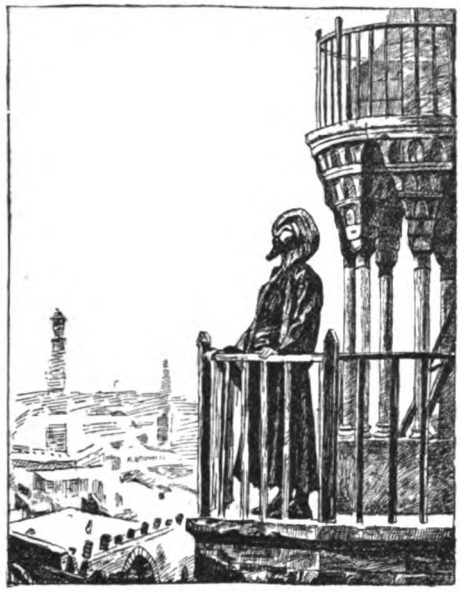
mentary, respiratory, and genito-urinary mucous membrane. They present certain structural peculiarities according to the functions they perform. In general, they consist of an external epithelial layer resting on a thin, transparent basement membrane, and beneath this a stratum of vascular tissue containing the glands, and, in the gastro-intestinal tract, the villi. They furnish the medium through which most all material changes in the organism are effected, and at the same time furnish protection.

**Mucronate.** Leaves or other organs which terminate abruptly in a short projection. The diminutive is Mucronulate.

**Mudwort.** *Limosella aquatica.* Minute herb of the natural family *Scrophulariaceæ*, native of the n. temperate zone.

**Mueller.** See MÜLLER.

**Muezzin.** Mohammedan official who calls to prayers five times a day. These hours are dawn, noon, four o'clock, sunset



Muezzin Calling to Prayers.

and nightfall. Mohammed chose the use of the human voice, because the Christians and Jews used bells and trumpets.

**Müffling,** FRIEDRICH FERDINAND KARL, FREIHERR VON, 1775–1851. Prussian general, field-marshal 1847.

**Mufti.** Mohammedan priest. The Grand Mufti, or Sheikh-ul-Islam, is head of the Ulema or sacred college, and an officer of much power in Turkey.

**Mugeir.** Site of a very ancient Chaldean city in the lower Euphrates valley, where are remains of an enormous temple in form of a terraced pyramid built of brick.

**Mügge,** THEODOR, 1806–1861. German novelist and descriptive writer. *France*, 1830; *England*, 1831; *Toussaint*, 1840; *Switzerland*, 1847, tr. 1848; *Afraja*, 1854.

**Muggins.** Game of cards played with a full pack by any number of persons, usually not exceeding six. The cards are dealt, and each turns up one in succession. They must be built on separate piles in the center of the table, commencing with the ace, if possible, or, if not, be placed, if next above or below in the suit, on another player's pile, which he forms with the cards he is unable to get rid of in this way. The player who breaks any of the rules of the game is said to be mugginsed, when the players cry "Muggins," and each gives him a card. The object is to first get rid of all the cards.

**Muggletonians.** Sect founded in London ab. 1651 by Lodowick Muggleton, 1610–1698, and John Reeve, d. 1658, "two witnesses" (Rev. xi. 3–6). The last member died 1868.

**Mugwort.** *Artemisia vulgaris.* Tall perennial herb of the Composite family, native of Europe, introduced as a weed into the U. S. The American Mugwort is *A. ludoviciana*, native of w. N. America.

**Mugwumps.** In the U. S., independents in politics, who are not tied to party, but vote as their individual reason and conscience dictate; so called since 1884, when many former Republicans supported Cleveland against Blaine. The term, in Eliot's Indian Bible, signified chief.

**Mühlbach,** LOUISE (CLARA MUNDT), 1814–1873, m. 1839. German historical novelist, for a time very popular.

**Mühlberg.** Saxon town on the Elbe. Here Charles V. defeated a Protestant army under Johann Friedrich, Elector of Saxony, April 24, 1547. Pop., 1890, 3,443.

**Mühldorf.** Town of Bavaria, on the Inn. Here Louis the Bavarian defeated Frederic of Austria Sept. 28, 1322.

**Mühlenberg,** HEINRICH MELCHIOR, D.D., 1711–1787. German patriarch of American Lutheranism. He emigrated 1742, and organized the Pa. Synod 1748. *Autobiog.*, pub. 1886.—Two of his sons left the ministry to serve their country. JOHN PETER GABRIEL, 1746–1807, was a general in the Revolutionary War, thrice M. C., and U. S. Senator 1801–2.—FREDERICK AUGUSTUS, 1750–1801, was M. C. 1789–97, and twice Speaker of the House.—A third, GOTTHILF HENRY ERNEST, 1753–1815, was Lutheran minister at Lancaster, Pa., from 1779, and wrote *Catalogus plantarum Americæ septentrionalis*, 1813; *Descriptio uberior graminum et plantarum calamariarum*, 1817.

**Muhlenberg,** WILLIAM AUGUSTUS, D.D., 1796–1877. Great-grandson of Dr. H. M.; rector of the first free P. E. Ch. in N.Y. 1846–58; founder of St. Luke's Hospital 1858, and of St. Johnland, L. I., 1866. *Sisterhoods*, 1853. Several of his hymns are widely used.

**Muhlenberg College.** Founded 1867 at Allentown, Pa., under Lutheran control. It has 9 professors, 4 instructors and 160 students including academic department.

**Mühlhausen.** Town of Prussian Saxony, on the Unstrut; held by Münzer and the Anabaptists 1525. Pop., 1890, 27,538.

**Muhrman,** HENRY, b. 1854. American water color and landscape painter.

**Muir,** JOHN, D.C.L., 1810–1882. Scottish Orientalist, in India 1828–53. *Sanskrit Texts*, 5 vols., 1858–70.—His brother, SIR WILLIAM, b. 1819, was an official in India 1837–76, then one of the Council of India, and in 1885 principal Univ. Edinburgh. *Life of Mahomet*, 4 vols., 1858–61; *The Koran*, 1878; *Rise of Islam*, 1881.

**Muir,** JOHN, b. 1836. Scottish-American naturalist. *Mountains of California*, 1894.

**Mukden,** or MOUKDEN. Capital of Manchuria since 1625, previously called Shenyang; 425 m. n. e. of Peking; walled with large suburbs; seat of several missions. Pop. ab. 200,000.

**Mulatto.** See NEGRO.

**Mulberry.** Trees of the genus *Morus*, natural family *Moraceæ*, natives of the n. temperate zone, often cultivated for their edible fruit, and from which a pleasant light wine is

Common Mulberry (*Morus nigra*).

made. The White Mulberry, *M. alba*, has been planted from time immemorial in China for its leaves as food for silkworms.

**Mulberry,** FRENCH. *Callicarpa americana.* Small-flowered shrub of the Verbena family, native of the s. e. U. S.

**Mulberry,** PAPER. *Broussonetia papyrifera.* Tree of the Mulberry family, bearing large leaves; extensively cultivated in China and Japan for its bark, which is made into paper; planted for ornament in the U. S.

**Mulcaster,** RICHARD, ab. 1530–1611. Master of Merchant Taylors' School, London, 1561, and of St. Paul's 1596; writer on education.

**Mulder,** GERARDUS JOHANNES, 1802–1880. Prof. Utrecht 1840. *Vegetable and Animal Physiology*, tr. 1849; *Chemistry of Wine*, tr. 1857.

**Mule.** Hybrid between two species; commonly, that produced by the union of ass and mare. Mules are valuable work animals in many parts of the country, as they will do more

work under coarse food and poor care than horses. They are also less liable to disease, and will stand a greater degree of heat. They are not usually fertile, though cases have been recorded of the female having produced young. See EQUUS.

**Mule-Deer** (CARIACUS MACROTIS). Deer with long ears (8 in.) and well developed horns, living on the mountain slopes of n.w. U. S. They rut in Oct. and cast horns in March; the young come March–June. The flesh is very fine venison.

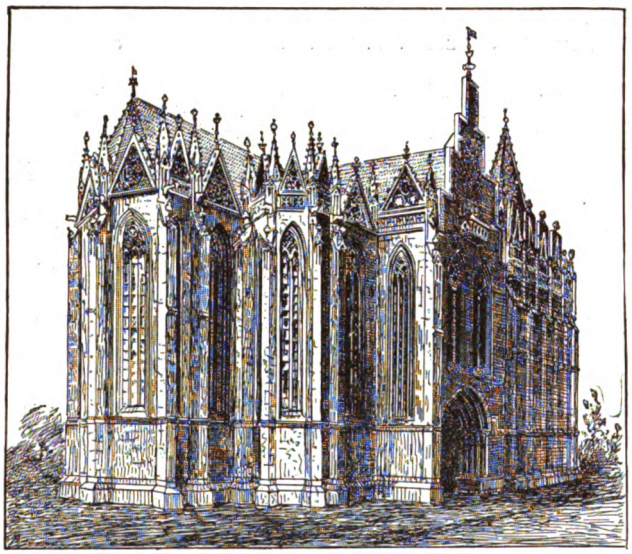
**Muley Saw.** Reciprocating saw for slabbing logs, driven by a pitman from below, the saw doing its work on its descent, and having no straining appliances for the upper end, which is guided by a cross-head only to take the thrust. A reciprocating sash or gate saw is sometimes, but improperly, so called.

**Mulford,** ELISHA, LL.D., 1833–1885. American divine and author. *The Nation*, 1870; *Republic of God*, 1881.

**Mulgrave,** CONSTANTINE JOHN PHIPPS, BARON, R.N., 1734–1792. Arctic explorer; discoverer of the Mulgrave Islands 1773.

**Mulhall,** MICHAEL G., b. 1836. Irish journalist, settled in Argentina. *River Plata*, 1885; *Dict. Statistics*, 1891.

**Mülhausen.** Town of Alsace-Lorraine, on the Ill; known from 717; free city 1273; Swiss 1515–1798; then French till 1870,



View of Maria Church at Mulhausen.

since German. It has large cotton manufactures. Pop., 1890, 76,892.

**Mull.** Third in size of the Hebrides. Area 347 sq. m.; pop. ab. 6,000.

**Mullein.** *Verbascum thapsus.* Tall, velvety perennial herb of the natural family *Scrophulariaceæ*, native of Europe; introduced as a weed into N. America; troublesome and unsightly in pastures. It is a biennial, and the first year shows only a tuft of velvety leaves; the second year a tall seed stalk, 3 to 5 ft. high, bearing yellow flowers, is sent up. It is easily subdued by cutting the seed stalk close to the ground before the seeds have formed. Another species, *V. blattaria*, or moth mullein, is occasionally somewhat troublesome, but may be combated in the same way.

**Muller.** Heavy sliding or rolling block of stone or of iron, used in grinding ores in pans, in an arrastre, or Chilian mill.

**Muller,** CHARLES LOUIS, 1822–1891. French painter.

**Müller,** EDUARD FRIEDRICH HERMANN LUCIAN, b. 1836. German philologist, prof. St. Petersburg from 1870; ed. Latin poets.

**Müller,** FERDINAND FREIHERR VON, b. 1825, in Germany. Australian botanist, ennobled 1870. *Fragmenta phytographiæ Australiæ*, 1858–68; *Census of Australian Plants*, 1882.

**Müller,** FRIEDRICH, 1749–1825. German poet, in Rome from 1778. *Idyls*, 1775.

**Muller,** FRIEDRICH, Ph.D., b. 1834. Austrian philologist; prof. Vienna from 1869.

**Müller,** (FRIEDRICH) MAX, b. 1823, in Dessau, Germany. Sanskrit scholar, linguist, and writer of essays on philological and mythological subjects; prof. Oxford 1850–75. Besides his works on the Science of Language, he is chief representative of that school in mythology which bases myths upon the "disease of language"; *i. e.*, the gradual misunderstanding and literal or personal application of words which originally described a purely natural process. *Chips from a German Workshop*, 4 vols., 1868–75; *Science of Religion*, 1870.

**Müller,** GEORGE, b. 1805. German-English divine, founder of the Bristol Orphanage 1836. *Life of Trust*, 1837.

**Müller,** GEORG ELIAS, b. 1850. Prof. Göttingen 1881; writer on philosophy.

**Müller,** JOHANNES, 1801–1858. Prof. Bonn 1826, Berlin 1833. *Physiology*, 1833, tr. 1837–42.

**Müller,** JOHANNES VON, 1752–1809. Historian of Switzerland, 5 vols., 1780–1808. *Universal History*, 3 vols., 1810; *Works*, 27 vols., 1800–17.

**Müller,** JOHANN GOTTHARD, 1747–1830. German engraver, prof. Stuttgart 1876.—His son, JOHANN FRIEDRICH WILHELM, 1782–1816, was also an eminent engraver.

**Müller,** JULIUS, 1801–1878. German theologian, prof. Marburg 1835, and Halle 1839. *Doctrine of Sin*, 1839, tr. 1868.—His brother, KARL OTTFRIED, 1797–1840, prof. Göttingen from 1819, was a noted archæologist, and wrote much on Greek history, topography, mythology, and literature, and on the Etruscans. *Hist. Greek Races and States*, 1839–44. His *Handbook of the Archæology of Art*, 1848, represents the best results of German classic learning following the period of Winckelmann.

**Müller,** WILHELM, 1794–1827. German lyric poet,

**Müller,** WOLFGANG, 1816–1873. German poet.

**Müllerian Duct.** Split off from the ventral side of the archinephric duct of the embryo. In the female it becomes the oviduct or Fallopian tube. In the male it aborts to the hydatid of Morgagni; even in the female, a portion (perhaps a primitive tubule) is present as a hydatid.

**Muller's Glass.** See HYALITE.

**Mullets.** See PERCESOCES.

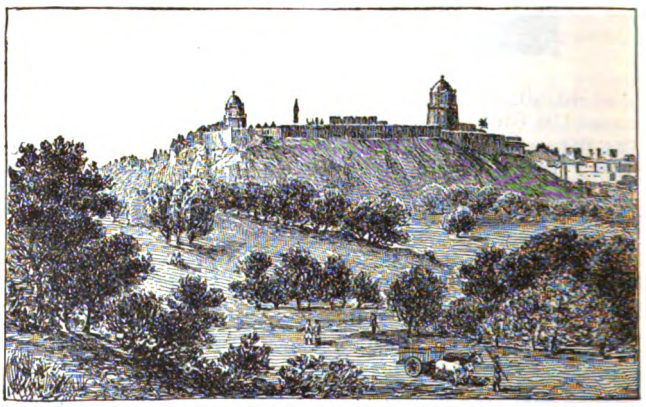
**Mullion.** In Gothic Architecture, upright bar of masonry or timber, subdividing a window or other opening.

**Müllner,** AMADEUS GOTTFRIED ADOLF, 1774–1829. German dramatist.

**Mulock,** DINAH MARIA. See CRAIK.

**Mulready,** WILLIAM, 1786–1863. Irish painter and illustrator of high repute, R.A. 1816.

**Multan,** or MOOLTAN. City of the Punjab, n.w. India, annexed by Britain 1849. It has a large trade, manufactures



Fort of Multan, in the Punjab.

of silk and cotton weaving and carpets, and very ancient ruins. It is inclosed on three sides by a wall open to the south. Pop., 1891, 74,510.

**Multicharge Gun.** One devised with several pockets or chambers along the bore containing charges of powder which would be successively ignited after the passage of the projectile, and thus increase its pressure. The most noted is the Lyman-Haskell gun, whose tests, however, did not result in securing its adoption.

**Multicipital.** Root or root-stock which branches into several stems.

**Multifecundation.** Passage of more than one spermatozoön into an egg and formation there of several segmentation nuclei. The female pronucleus undergoes division to furnish each male pronucleus with a mate. The further development is abortive.

**Multifoliolate.** Compound leaf composed of numerous leaflets, as the Locust.

**Multijugate.** Pinnately compound leaves with numerous pairs of leaflets.

**Multilocular.** Ovaries or fruits with several cavities.

**Multinomial Theorem.** Formula for raising a polynomial to any power; specific form of the general Binomial Theorem.

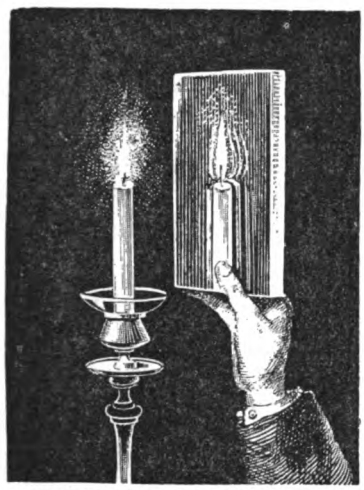
**Multiple.** Repetition of a quantity as a term; *e.g.*, 12, 16, 24, are multiples of 4. In Algebra, any expression in which the quantity is a factor; a b x may be considered a multiple of a, of b, or of x.

**Multiple Algebra.** That involving two or more independent concepts (or letters); distinguished from Single Algebra, which has but one independent concept (or letter).

**Multiple Arc.** See BATTERY, ELECTRIC.

**Multiple Fruits.** Those formed by the ripening of the pistils of a flower cluster, these becoming more or less densely adherent as in the cone of pines, firs, etc. They are also termed Collective.

**Multiple Images.** If an object be placed between two parallel mirrors, or in the angle formed by two inclined ones, a number of images may be observed due to the multiple reflections in the two mirrors alternately. The number of images visible depends upon the angle of inclination of the mirrors. The phenomenon is also observed in the reflections from a piece of thick plate-glass, the multiple images in this case being due to the alternate reflections from the two surfaces.



Images of Candle in Looking-Glass.

**Multiple Points** OF A CURVE. Those where two or more branches intersect, double, triple, etc., according to the number of intersecting branches. They are determined by values of the first differential coefficient of the equation of the curve. Values of the variables which satisfy the equation of the locus and give two values to the first differential coefficient determine double multiple points. If the differential coefficient has three values, the multiple point is triple.

**Multiple Standard,** or TENDER. Standard of value or of deferred payment, intended to obviate the loss to debtor or creditor arising from the change in the value of gold or silver in considerable periods of time, formed by joining together the value of a number of articles, so that their changes in value will counteract one another.

**Multiple Stars.** Those which appear to the eye to be single, but are shown by the telescope to consist of several stars in close proximity.

**Multiplication,** ALGEBRAIC. Combining several factors in one product. Numerical factors are combined, except as regards signs, as in arithmetical multiplication. Literal factors are multiplied, if the letters or aggregates are the same, by adding their exponents; otherwise, by writing the factors in sequence, the aggregates being inclosed in parentheses or multiplied term by term under the distributive law. The product is positive when the factors are all positive or there is an even number of negative factors; it is negative when there is an odd number of negative factors. Algebraic multiplication is commutative: the order of factors may be changed without change of product. It is associative: the order of operation as between several factors may be changed without affecting the result. It is distributive: the product of an aggregate by any factor is the same as the aggregate of the several products of all the terms by the same factor.

**Multiplication,** ARITHMETICAL. Process of repeating one number as many times as there are units in another. The number repeated is the multiplicand; that which shows how much it is repeated is the multiplier; the result is the product. The character of the multiplicand attaches to the product.

**Multiplication,** GEOMETRIC. Process in higher algebra and vector analysis in which one quantity is submitted to the operation of another. In vector multiplication the operator is a unit vector acting at right angles, and the effect is a revolution, which in the case of rectangular vectors passes through 90°. Geometric multiplication is non-commutative as to the factors, though the negative sign is commutative with rectangular unit vectors. The distributive law also applies. The product of two vectors is a quaternion.

**Multiplication of Quaternions.** The product of two quaternions is a quaternion. The multiplication is non-commutative unless the quaternions are complanar. The associative and distributive laws hold, and the tensor or versor of the product is the product of the tensors or versors of the quaternion factors.

**Multiplier.** Test galvanometer with several turns of wire, first suggested by Schweigger. If the wire forms but a small part of the total resistance in the circuit, the effect on the needle is proportional to the number of turns; hence the name.

**Multipolar Immigration.** See GASTRULATION.

**Multivalve.** Shells composed of more than two pieces.

**Multivoltine.** Producing more than one brood of young annually.

**Multungulate.** Having more than one hoof on each foot. See DIPLARTHRA.

**Mum.** Beer made from wheat malt.

**Mumble-the-Peg,** or KNIFE. Game played with a jack-knife, and named from the penalty imposed upon the loser. Any number may play it. It consists of performing a certain set of feats with the open knife, each of which depends upon the blade eventually sticking in the ground so as to support the knife. The players take turns, and the last to complete the series is obliged to extricate from the ground with his teeth a wooden peg driven home by successive blows with the knife handle by the other competitors, each having three strokes at it.

**Mummies.** The custom of preserving the bodies of the dead by a process of embalmment was based upon the idea of a material resurrection, and was practiced, not only by the Egyptians and other nations of classical antiquity, but in the New World, notably in Peru, among the cliff-dwellers, and on the Aleutian Islands. In Egypt not only human bodies, but

Mummy of Child from Peru, in its Wrappings.

Mummy of Man from Peru.

those of animals, as bulls, ibises, and crocodiles were thus preserved. The Egyptians mummified their dead from earliest times. The art reached the highest point at Thebes in the 18th and 19th Dynasties; the practice continued to 500 A. D. A great variety of methods were employed, and amulets and magical appliances used to vitalize the various organs.

**Mummius,** First cent. Latin fabulist, known by fragments.

**Mummius,** LUCIUS. Roman consul 146 B. C.; conqueror of the Achæan League and of Greece. He pillaged and destroyed Corinth, sending many of its treasures to Rome.

**Mumps.** See PAROTITIS.

**Munch,** PETER ANDREAS, 1810–1863. Prof. Christiania 1837; tr. *Elder Edda*, 1847, and three sagas. *Hist. Norwegians*, 8 vols., 1852–63.

**Munch,** PETER ANDREAS, 1811–1884. Norwegian dramatist, poet, and novelist. *Lord Wm. Russell*, 1857, tr. 1862; *Maid of Norway*, 1861, tr. 1877.

**Munchausen,** HIERONYMUS KARL FRIEDRICH, BARON VON, 1720–1797. Hanoverian soldier, alleged teller of marvelous stories. The *Narrative*, which bears his name was written or compiled by Rudolph E. Raspe, and pub. in English 1785, and in German 1786. Some of the tales are much older.

**Münch-Bellinghausen,** ELIGIUS FRANZ JOSEPH, BARON VON ("FRIEDRICH HALM"), 1806–1871. Austrian dramatist. *Griseldis*, 1834. His *Sohn der Wildniss*, 1843, is well known on the English stage as *Ingomar*.

**Muncie.** Capital of Delaware co., Ind., on White River. Pop., 1890, 11,345.

**Munda.** Town in Bætica, s. Hispania, noted for Scipio's defeat of the Carthaginians 216 B. C., and Cæsar's victory over Pompey's sons 45 B. C.

**Mundé,** PAUL FORTUNATUS, M.D., b. 1846, in Germany. Prof. of Gynæcology at Dartmouth 1880, and later in New York; professional writer.

**Mundella,** ANTHONY JOHN, b. 1825. M.P. 1868; Pres. Board of Trade 1886 and 1892–94.

**Mundic.** Iron pyrites; so called by miners.

**Muñecas,** ILDEFONSO DE LAS, 1776–1816. Peruvian priest and patriot, victorious over Spaniards 1814; defeated and slain.

**Munger,** THEODORE THORNTON, D.D., b. 1830. Cong. pastor at New Haven since 1885. *On the Threshold*, 1881; *Freedom of Faith*, 1883; *Lamps and Paths*, 1885; *Appeal to Life*, 1887.

**Mungo,** ST., or KENTIGERN, ab. 518–603. Apostle of Wales.

**Mungoos.** See MONGOOSE.

**Munich.** Capital of Bavaria, on the Isar; known since 1158; eminent among German cities for its fine buildings and institutions of learning and art. Its development has been chiefly since 1820. The university founded at Ingolstadt 1472, removed to Landshut 1800, to M. 1826, had in 1895 ab.175 instructors, 3.561 students, and a library of over 300,000 vols. The Glyptothek was erected 1816–30, the Old Pinakothek 1826–36, and the New 1846–53. Pop., 1890, 349,024.

**Municipal Corporations.** Created by government for political and administrative purposes, and generally possessed of power of local legislation. Municipal government originated with the Romans, and now exists in various forms in the city, town, borough, and parish, but deriving its powers by charter from the legislature of the country or State, to which appeal must be made for any modifications. In U. S. the city government usually consists of a mayor, an executive officer, with veto power, and a council, a deliberative body, sometimes with a second chamber, board of aldermen. These make regulations for the collection of taxes, the elections, schools, poor, police, public health, the repairs of streets, water supply, and sometimes the lighting. There are also police or city courts, with limited jurisdiction. The towns and boroughs have similar government, though less broad, and with no judicial functions, these being relegated to county courts, or, in minor cases, to justices of peace appointed by the Governor. The county provides the court of justice, the jail, and the poorhouse and bridges, the last three usually in charge of commissioners duly elected. In England, the local government is vested in county, city, town, borough and parish, the city, town and borough having limited powers, the parish having charge of paving and lighting streets, the poor, etc. France is divided into communes, each governed by a council elected by universal suffrage. Italy and Belgium have similar systems. In Germany there is a certain property qualification in local elections. In addition to the functions mentioned, some cities run the local railroads and slaughter-houses.

**Municipal Engineering.** The construction of street pavements, sewers, and water works, necessitates a department of city government, at whose head is a city engineer. The most accurate methods of surveying are required in cities where property is very valuable. A city engineer is usually required to give bonds for the correct performance of his work.

**Municipality.** Town or city to some extent self-governing; also, its local authorities.

**Municipal Law.** That of a nation is often so called, in contradistinction from International Law.

**Munk,** HANS, 1589–1628. Danish explorer of Arctic regions 1619–20, 1621–23, and 1627–28. His narrative was pub. 1623–27, and tr. 1685.

**Munk,** HERMANN, b. 1839. Prof. Berlin 1869; writer on physiology.

**Munk,** SALOMON, 1805–1867. German Jew, prof. Coll. de France 1865. He tr. Maimonide's *Guide of the Straying*, 3 vols., 1856–66, and wrote much on Hebrew and Arabic literature.

**Munkácsy** (LIEB), MIHÁLY, b. 1846. Hungarian painter of great power and repute. His *Christ before Pilate* was exhibited 1886 in many cities of the U. S.

**Muñoz,** JUAN BAUTISTA, 1745–1799. Spanish historian of the New World (to 1500), 1793.

**Munro,** HUGH ANDREW JOHNSTONE, D.C.L., 1819–1885. Latin prof. Cambridge 1869–72; ed. Lucretius, 1864, and Horace, 1869.

**Munroe,** KIRK, b. . American writer of tales for boys. *Fur Seal's Tooth*, 1895; *Snowshoes and Sledges*, 1896.

**Munsell,** JOEL, 1808–1880. Printer at Albany, N. Y., from 1827; author or editor of historical works. *Annals* of Albany, 10 vols., 1849–59; *Paper-making*, 1857–64.

**Munson,** JAMES EUGENE, b. 1835. American inventor and writer. *Complete Phonographer*, 1866–77.

**Münster.** Capital of Westphalia, on the Aar; outgrowth of a monastery founded ab. 1050; scene of Anabaptist troubles 1535; held by Prussia since 1814. It has some fine old buildings, and had a R.C. university till 1818. The small coinage of the city and its bishops was abundant till 1760, and of the chapter till 1790. Pop., 1890, 49,340.

**Münster,** TREATY OF. Signed Oct. 24, 1648. It acknowledged the independence of the United Netherlands, first recognized the principle of a balance of power in Europe, and ended the Thirty Years' War. It is known also as the Peace of Westphalia.

**Münster,** SEBASTIAN, 1489–1552. Prof. Heidelberg 1530, and Basel from 1536; editor of a Hebrew Bible, grammar, and lexicon. *Cosmographia*, 1544.

**Münsterberg,** HUGO, b. 1863 in Germany. Prof. Harvard 1892; writer on psychology.

**Muntaner,** RAMON, 1265–1336. Spanish chronicler. His work covers the period 1208–1328, was pub. 1558, and has been tr. into French, German, and Italian.

**Münter,** BALTHASAR, 1735–1793. German Minister at Copenhagen; author of a book on Count Struensee, tr. 1773.—His son, FRIEDRIK CHRISTIAN CARL HENRIK, 1761–1830, prof. Copenhagen 1790, Bp. of Sealand 1808, wrote much on ancient and mediæval history.

**Muntjac.** Small solitary deer of India, China, and Malaysia. It stands 2 ft. high at shoulders, has projecting canines and vertical horns with only one branch (brow-antler). It inhabits hilly forests.

**Muntz Metal.** Alloy of 60 parts copper and 40 zinc, used for sheathing wooden ships, to protect them from the teredo, also called Yellow Metal.

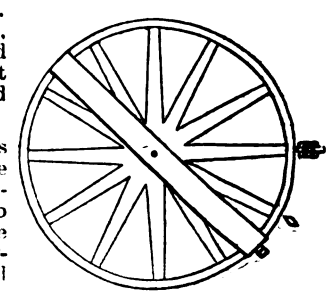
**Munychia.** Harbor of Athens, and adjacent hill, where Thrasybulus defeated the 30 Tyrants 404 B.C.

**Münzer,** THOMAS, 1489–1525. Anabaptist pastor at Mühlhausen, executed there for inciting and leading the Peasants' War.

**Murad,** or AMURATH. I. Turkish sultan 1359–89. He added Roumelia, Bulgaria, and Servia to the empire, and gained great victories at Adrianople 1361, and at Kosovo 1389. —II. Sultan 1421–51. He besieged Constantinople 1422, was twice defeated by the Christians under Hunyady and Cardinal Julian, was victorious at Warna 1444, and twice abdicated and twice resumed the government.—III. Sultan 1574–95; involved in wars with Persia and Austria, revolts of the provinces, and troubles with the Janizaries.—IV. Sultan 1623–40. He reduced the Janizaries to obedience, invaded Persia, and took Bagdad by storm 1638.—V. b.1840; sultan May–Aug. 1876; deposed as insane.

**Muræniidæ.** See APODES.

**Mural Circle.** Old form of instrument for measuring the altitude or declination of a star. It consists of a graduated circle, from 4 to 8 ft. diameter, mounted on the face of a wall or pier. It is provided with a telescope and 4 or 6 reading microscopes.



Mural Circle.

**Mural Decoration.** This dates from ancient times. The Egyptian and Etruscan monuments have greatly helped to form certain styles of art. See ARABESQUE, ENCAUSTIC PAINTING, POTTERY, SGRAFFITO, and TAPESTRY.

**Murat,** JOACHIM, 1771–1815. French general of 1799; educated for the church; aid to Napoleon 1795; married to Caroline, Napoleon's sister, 1800; distinguished in many battles; Marshal 1804; King of Naples 1808–14. He invaded Naples 1815, was captured and executed.—His son, NAPOLÉON ACHILLE, 1801–1847, lived in Florida from 1822, and pub. three books on America. His *Principes du Gouvernement Républicain*, 1838, has circulated widely in Europe.—His brother, LUCIEN CHARLES, 1803–1878, was in the U. S. 1825–48, and became a French senator and prince 1852.

**Muratori,** LODOVICO ANTONIO, 1672–1750. Italian historian, librarian at Milan 1694, and at Moden 1700. His chief works are *Rerum Italicarum Scriptores*, 29 vols., 1723–51; *Antiquitates Italicæ Medii Ævi*, 6 vols., 1738–42; *Thesaurus Veterum Inscriptiorum*, 6 vols., 1739–42; *Annals of Italy*, 12 vols., 1744–49.

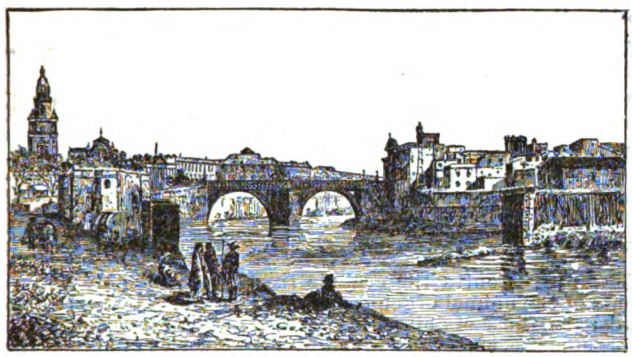
**Muravieff,** MICHAEL, 1757–1807. Russian poet and senator. *Works*, 1820.

**Muravieff,** NICOLAS, 1768–1840. Russian general of prominence, as were also his sons, ALEXANDER, 1792–1864, NICOLAS, 1793–1856, and MICHAEL, 1796–1866. Another son, ANDREAS, 1798–1874, was a noted historical and descriptive writer.

**Muravieff-Apostol,** IVAN, 1769–1851. Russian writer and translator.

**Murchison,** SIR RODERICK IMPEY, F.R.S., D.C.L., 1792–1871. Scottish geologist, knighted 1846, Baronet 1863. From 1824 he made valuable observations in England and Scotland, and with Sedgwick on the structure of the Alps. In 1831 he began the study of the rocks underlying the Old Red Sandstone on the border of Wales, and in 1839 brought to notice for the first time a remarkable series of formations, each replete with distinctive organic remains, older than and very different from those of other rocks of England, now traced in almost all parts of the world and known as the Silurian System. With Sedgwick he established the Devonian System, and, in 1840–45, with De Verneuil and Keyserling, made explorations of the rocks of Russia. *Silurian System*, 1839–54; *Ural Mountains*, 1845.

**Murcia.** City of e. Spain, on the river Segura; taken from the Moors 1263. It has various manufactures, including a government saltpeter and gunpowder factory. It suffered greatly by an inundation 1651, and was sacked by Soult 1812. Pop., 1887, 98,538.



Murcia.

**Murder.** Willful killing of a human being with malice aforethought; generally punished by death.

**Murdoch,** JAMES EDWARD, 1811–1893. American actor, retired 1858; well known later as a reader and elocutionist.

**Murdock,** JAMES, D.D., 1776–1856. Prof. Univ. Vt. 1815–19, and at Andover 1819–28. *Atonement*, 1823; tr. Mosheim's *Institutes Eccl. Hist.*, 1832, and *Commentaries*, 1851–52.

**Murdock,** WILLIAM, 1754–1839. Scottish engineer in Cornwall, inventor of illuminating gas 1792–98.

**Mure,** SIR WILLIAM, 1594–1657. Scottish poet. *True Crucifixe*, 1629; version of the Psalms, 1639.

**Mure,** WILLIAM, 1799–1860. Scottish M. P. 1846–55. *Language and Literature of Greece*, 5 vols., 1850–57.

**Muret.** Town of s. France, where Montfort defeated the Albigenses 1213.

**Muret,** or **Muretus,** MARC ANTOINE, 1526–1585. French critic and poet, who taught at Paris, Toulouse, and Rome. He wrote chiefly in Latin, and annotated several classical authors. His Latin style was much praised.

**Murexide.** $C_8H_{10}N_6O_6+H_2O$. Acid ammonium salt of purpuric acid, produced by heating alloxan and alloxantin with ammonium carbonate; brown crystals, soluble in hot water. It is a violet red dye-stuff, not extensively used.

**Murfree,** MARY NOAILLES ("CHARLES EGBERT CRADDOCK"), b. ab. 1850. American novelist. *In the Tennessee Mountains*, 1884; *Where the Battle was Fought*, 1884; *Prophet of the Great Smoky Mts.*, 1885; *Despot of Broomsedge Cove*, 1888; *In the Stranger People's Country*, 1891; *His Vanished Star*, 1894.

**Murfreesboro.** Capital of Rutherford co., Tenn., and of the State 1819–26; 33 m. s.e. of Nashville; scene of a battle, "Stone River," Dec. 31, 1862, and Jan. 2, 1863. The Confederates under Bragg withdrew with loss of nearly 10,000 out of 47,000 men; the Union forces and loss were nearly the same. Pop., 1890, 3,739.

**Murger,** HENRI, 1822–1861. French poet and novelist. *Bohemian Life*, 1848; *Youth*, 1851; *Water-Drinkers*, 1854.

**Muriatic Acid.** See HYDROCHLORIC ACID.

**Muricate.** Organs or organisms covered with short, sharp projections.

**Muricidæ.** See RHACHIGLOSSA.

**Muridæ.** See MYOMORPHA.

**Murillo,** BARTOLOMEO ESTEBAN, 1617–1682. Spanish painter, next to Velasquez, the greatest of his time. Successful both in realistic and in religious art; warm in color and broad in brush work. His *Immaculate Conception* in the Louvre has special popularity.

Immaculate Conception, by Murillo.

**Murner,** THOMAS, D.D., 1475–1537. Franciscan of Strassburg, whose life was spent in wandering and in controversy, chiefly with the reformers; eminent as a satirist.

**Murphy,** ARTHUR, 1727–1805. Irish playwright. Tr. Tacitus, 1793.

**Murphy,** JAMES GRACEY, D.D., LL.D., b. 1808. Prof. Belfast 1847–88; O. T. commentator.

**Murrain.** See CATTLE PLAGUE.

**Murray,** ALEXANDER, D.D., 1775–1813. Prof. Edinburgh 1812. *Oriental Philology*, 1812; *Hist. European Languages*, 1823.

**Murray,** DAVID, Ph.D., LL.D., b. 1829. Prof. Rutgers Coll. 1863–73, in Japan 1873–78, sec. Regents Univ. N. Y. 1878–88. Ed. *Japanese Education*, 1876; *Story of Japan*, 1894.

**Murray,** DAVID CHRISTIE, b. 1847. English novelist. *Joseph's Coat*, 1881; *Hearts*, 1883; *Cynic Fortune*, 1886; *The Martyred Fool*, 1895.

**Murray,** EUSTACE CLARE GRENVILLE, 1819–1881. English novelist and journalist. *Roving Englishman*, 1854; *Member for Paris*, 1871. His *Young Brown*, 1874, is in part autobiographic.

**Murray,** HUGH, 1779–1846. Scottish geographer.

**Murray,** JAMES AUGUSTUS HENRY, LL.D., b. 1837. Scottish linguist; pres. Philological Soc. 1879–80, and ed. since 1879 of its *New English Dictionary*. *Dialects*, 1873.

**Murray,** JAMES CLARKE, b. 1836 in Scotland. Prof. Kingston, Canada, 1862, McGill Univ. 1872. *Outline of Sir W. Hamilton's Philosophy*, 1870; *Psychology*, 1885; *Ethics*, 1891.

**Murray,** JAMES ORMSBY, D.D., LL.D., b. 1827. Prof. English Literature Princeton 1875, Dean 1885. *Life of Francis Wayland*, 1891.

**Murray,** or **Moray,** JAMES STUART, EARL OF, ab. 1533–1570. Illegitimate son of James V. of Scotland and Lady Margaret Erskine of Mar, and half-brother of Queen Mary; lay Prior of St. Andrew's 1538; Earl of Mar 1562; Regent for James VI. 1567; murdered. He was a principal promoter of the Scottish Reformation.

**Murray,** JOHANN ANDREAS, M.D., 1740–1791. Prof. of Medicine and Botany at Göttingen. *Prodromus designationis stirpium Gottingensium*, 1770; *Apparatus medicaminum*, 1776–92.

**Murray,** JOHN, 1741–1815. Chief founder of Universalism in America. He came from England 1770, and was pastor in Boston 1793–1800.

**Murray,** JOHN, 1778–1843. London publisher. The house was founded by his father, JOHN MCMURRAY, 1745–1793, and continued by his son, JOHN, 1808–1894; it is now conducted by his grandson.

**Murray,** LINDLEY, 1745–1826. American author of a famous *English Grammar*, 1795, and other works; resident in England from 1787. His *Power of Religion*, 1787, was tr. into French.

**Murray,** NICHOLAS, D.D., 1802–1861. Irish-American divine, noted for letters as "Kirwan" to Abp. Hughes, 1847–55. *Romanism at Home*, 1852.

**Murray,** WILLIAM HENRY HARRISON, b. 1840. Pastor in Boston 1868–74. *Camp Life*, 1868; *Adirondack Tales*, 1877.

**Murray,** WILLIAM VANS, 1762–1803. M.C. from Md. 1791–97; U. S. Minister to The Hague 1797–1801; chief negotiator of the treaty with France 1800. *Constitution and Laws.*

**Murray River.** In s.e. Australia. It heads in the Australian Alps, flows n.w., w., and s., and empties into Encounter Bay. Length ab. 1,150 m., drainage area 270,000 sq. m.

**Murten,** BATTLE OF. See MORAT.

**Murzuk.** Oasis. Capital of Fezzan, situated in the center of the country. It lies on the track of the caravans traversing

General view of Murzuk.

in the direction of the Soudan, and is very unhealthy. It is at an altitude of 1,650 ft., has an area of ab. 1 sq. m., and is surrounded by an earthen wall. Pop. ab. 8,000.

**Musæus.** 1. Mythical hymnist of pre-Homeric times. 2. Poet of 3d cent. B.C. 3. Author of an epic on Hero and Leander.

**Musæus,** JOHANN KARL AUGUST, 1735–1787. German satirist and writer of tales.

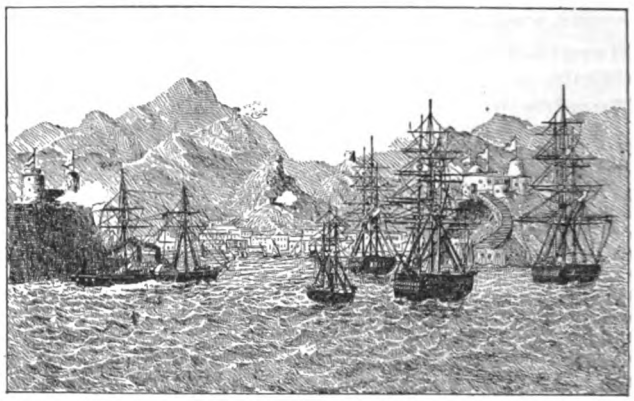
**Musca.** Genus of Flies (*Diptera*), including *M. domestica*, the ordinary House-fly, and 19 other species, mostly in the Old World. About 120 white, cylindrical eggs are laid by one female, preferably in decaying vegetable matter in moist, warm manure. In a day the conical larvæ hatch, and in less than a week they have changed to brown pupæ. The winged insects emerge a week later. In latitudes having cold winters, the summer generations live 3 or 4 weeks, but the last ones, viz., those emerging in November, hibernate until May, the females usually alone surviving.

**Muscæ Volitantes.** See ENTOPTIC SENSATIONS.

**Muscardine.** Disease of silk-worms produced by *Botrytis bassiana*, a fungus.

**Muscaria.** Tribe of *Brachycera* (flies) having a fleshy terminal lobe to the proboscis, with rudimentary maxillæ. The larvæ have no sheath to the jaws, but have two or four oval hooks. The pupæ are barrel-shaped. Here belong the House-fly (*Musca*), and the Horse-bots (OESTRIDÆ, q.v.).

**Muscat.** Capital of Oman, s.e. Arabia; near the Arabian Sea; held by Portugal 1508–1658; place of some commercial importance owing to its position. Its exports are dried fish,



Bombardment of Muscat by the Sultan 1868.

dates and other fruit. Its climate is one of the hottest in the world. Pop. over 20,000.

**Muscatel.** Sweet, high-flavored white or red wines, produced in France, Italy, and other countries.

**Muscatine.** City of M. co., Iowa, on the Mississippi; founded 1836, chartered 1853. Pop., 1890, 11,454.

**Musci.** Class of *Bryophyta*, comprising the true mosses. They are small plants, widely distributed over the earth; several thousand species are known; they are of little economical importance.

**Muscineæ.** See BRYOPHYTA.

**Muscle.** Contractile organic tissue by which the movements of the animal organism are performed. There are two kinds; viz., those of animal life, striped or voluntary, and those of organic life, smooth or involuntary. Muscles of animal life are under the control of the will; they are composed of fasciculi of fibers inclosed in a delicate tissue called internal perimysium. Muscles of organic life are composed of spindle-shaped contractile nucleated fibers collected into flattened bands. They are found in the alimentary canal, uterus, bladder, etc. They are not directly under the control of the will.

**Muscle Reading.** See MIND READING.

**Muscovite.** Common MICA (q.v.).

**Muscovy Duck** (CAIRINA MOSCHATA). Large Brazilian duck, widely domesticated though not relished for food. The male produces sterile hybrids with the domestic Mallards.

**Muscovy Glass.** Common mica, so-called from its former use in Siberia as a substitute for window glass.

**Muscular Sense.** Complex sensations by which we become aware of the position and movements of our body and limbs, judge of weight, resistance, etc., and automatically and correctly carry out complex coördinated movements, such as walking and writing. A complete analysis of muscular sensation has not yet been made; it includes impressions from the skin, muscles, joints, ligaments, and fasciæ, which seem to be primarily results of movements: the representations of these movements in consciousness become the guides and stimuli for correctly performing similar movements again. The existence was long postulated of a "sense of innervation," *i.e.*, sensation accompanying the discharge of energy into a motor nerve, which was supposed to be the chief guide in the performance of a desired movement; but this idea has now been abandoned by the best modern psychologists, the theory being that the discharge from a motor nerve-cell into a motor nerve-fiber is unaccompanied by sensation, and that the sensations which are perceived at the moment of inaugurating a movement are the results of actual muscular contractions inhibiting counter movements, or are the representations of the movement itself, conceived as carried out.

**Muses.** Goddesses of song, afterward of poetry and the arts and sciences; daughters of Jupiter and Mnemosyne (Memory); born in Pieria; at first three, afterward nine; Clio, muse of history; Euterpe, of lyric poetry; Thalia, of comedy; Melpomene, of tragedy; Terpsichore, of choral dance and song; Erato, of erotic poetry; Polyhymnia, of the sublime hymn; Urania, of astronomy; Calliope, of epic poetry. Apollo was leader of their choir.

**Museum.** In ancient times a temple of the Muses, now an institution for the preservation of works of art, antiquities,

and objects of natural history, and for their use in the enlightenment of the people. See ALEXANDRIAN LIBRARY, BRITISH MUSEUM, CORCORAN GALLERY OF ART, KENSINGTON, LATERAN MUSEUM, LOUVRE, NATIONAL MUSEUM, PITTI GALLERY, VATICAN, etc.

**Mushroom.** Edible fungus of the order *Hymenomycetes*, the *Agaricus campestris*, growing in fields in the n. temperate zone, and cultivated as a delicacy. There are 1,000 species of *Agaricaceæ*, one-fourth of which are harmless. Some other families also have edible species. The mushroom consists of microscopic vegetative filaments which grow in earth, feeding upon the organic matter contained therein. From this filamentous portion are formed white nodules (buttons), which as they grow develop each a stalk (stipe), that finally is crowned by a cap (pileus). On the under side of the cap are three radiating plates, the gills, on which the spores are borne in great numbers. The pileus is silky or downy, white or brown, the margin united by a veil to the stem when young; the gills are pink, becoming almost black with age; the stem is quite solid; the odor is agreeable. While the open grass field is the native haunt of the mushroom, it can be readily made to grow in many dissimilar places, as cellars, sheds, greenhouses, and particularly caves. In caves near Paris a large subterranean industry is carried on. Mushrooms are grown in beds, consisting of a mixture of manure and loam, and flat or ridged. The newly made bed will soon warm up to 110° F. and is then ready for spawning. This consists in inserting bits of the spawn into the bed, from which the filaments of the mushroom develop until the whole bed is filled with them, and afterward produce the mushrooms. The spawn consists of portions of a mushroom bed well stocked with the vegetative filaments of the mushroom that have been cut into "bricks" and dried. The bed could be seeded with the spores from gills of ripe mushrooms, but a much longer time would be required. The spawn is made on a large scale by some growers, most extensively in France, and the "bricks" are a regular article of trade at the seed stores. The only safe rule to follow in selecting toadstools is never to use a species about which there is any doubt, to become familiar with the mushroom and a few other edible sorts, and to discard all others. They should be used while fresh. Avoid those which have a milky juice, or change color when cut, or have bright colors.

Mushroom cave, 70 ft. under ground, near Paris.

**Mushroom,** POISONING BY. This is of rare occurrence. It results from eating mushrooms containing toxic ptomaines; among which may be mentioned Agaricus muscarius, Russula emetica, Agaricus vernus, Boletus luridus and Boletus satanus, etc. The symptoms after the ingestion of poisonous mushrooms are a gastro-intestinal irritation, colic, nausea, vomiting and diarrhœa. In more severe and fatal cases, rice-watery discharges, collapse, coma and death. Children are more susceptible and frequently have convulsions. Treatment, non-depressing emetics to evacuate the stomach and oleaginous purgatives. Atropia appears to be the direct antidote to muscarina, the alkaliod of Agaricus muscarius.

**Music,** HISTORY OF. Though the study of modern musical history is now a century old, it is still struggling toward a regulation. Each historian who has attempted original research has followed a plan of his own, and there has not yet been such a complete collation of material as will enable a writer to present an account showing the continuous and progressive growth of the art from its beginnings to its present state. Moreover, the artistic conception of the art varies so greatly with different peoples that it seems impossible to bring them all under one head. So far as the music of antiquity is concerned, Egyptian, Hindoo, Chinese, and Hebrew might be relegated to ethnology, since their direct influences upon the occidental art are insignificant if not nil. Greek music, on the contrary, concerns the modern art directly, since it was the foundation of the system of Church modes of the centuries during which the popes, led by SS. Ambrose and Gregory, regulated the service music and encouraged singing schools. The connecting link for centuries was Boëthius's book *De Musica*. The next epoch was that which saw the beginning of harmony, the improvment of notation to a point which made it possible to fix pitch definitely, and a recognition of secular tunes, till then wholly outside the pale of art as well as the Church, by their use in polyphonic composition, ab. 800–1400. The next two centuries saw the highest development of the polyphonic, ecclesiastical art in the compositions of Dufay, Okeghem, Josquin des Près, Goudimel, Arcadelt, Willaert, de Lasso, the Gabrieli, Palestrina, and others. When this art reached its zenith, then came, ab. 1600, the reformatory movement in Florence (see OPERA), which brought the monodic style, created the lyric drama, and introduced modern tonality. The period 1700–1827 saw the origin, development, and full fruition of the classical period in Bach, Handel, Glück, Haydn, Mozart, and Beethoven. Then followed the Romantic movement, still dominant, which raised content over form and, besides modifying the instrumental forms, culminated in the lyric drama of Wagner.

**Musical Glasses.** See HARMONICA.

**Musical Interval.** See INTERVALS.

**Music Festival.** See FESTIVALS.

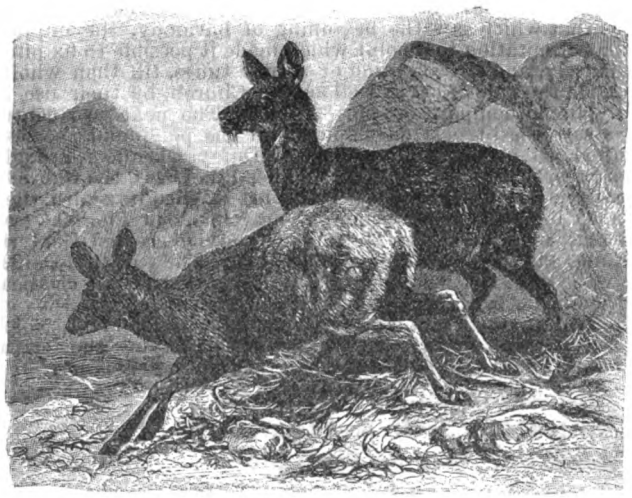
**Music in America.** Strictly speaking, the study of the growth of musical culture in America is local study. Since the country has acquired a position which makes energetic cultivation of the arts possible, the influences and chief agencies to that end have been imported from abroad; *e.g.*, orchestral music has remained German to all intents and purposes. It is possible, however, to find certain local centers from which various musical activities spread over the country. Choral music, which roots in the church, received its impulses from Boston. For the first century its progress was slow, because of the Puritan prejudice against all ornate music. Since few, if any, professional musicians were among the early colonists, when the church choir became emancipated they were under the control of rude naturalists in music, who, while they encouraged singing, did little to refine popular taste. Out of the ch. choirs, however, grew the larger aggregations called singing societies, the earliest of which we have record being that of Stoughton, Mass., founded 1786. That there were earlier societies seems likely. The Independent Music Society of Boston was also organized 1786, and was followed by the Franklin 1804, the Mass. Musical 1807, Lock Hospital 1812, societies in Salem, Middlesex, and West Boston, and the Handel and Haydn of Boston, still flourishing. The Philharmonic Society of Bethlehem, Pa., gave concerts in 1807. After 1825 the singing-school teachers of New England began to hold conventions, which in some instances developed into FESTIVALS (q.v.), and helped in the rapid spread of choral culture throughout the country. Facilities for estimating the extent of this culture in the U. S. are meager, but in 1890 there were 12 cities having choirs of from 200 to 500 voices, 13 from 100 to 200, 17 of 100 or less (not counting church choirs), and in at least 50 cities oratorios were annually performed, generally with orchestral accompaniment. The growth of orchestral music was earliest and most vigorous in New York City, where it was encouraged by the theater, and the toleration in religious service brought by the Ch. of England. Yet the theatrical bands were imperfect affairs until ab. 1850. The first adequate concert organization was the New York Philharmonic Society, founded 1842. In 1896 New York, Boston, Chicago, and Cincinnati supported orchestral institutions of the first rank devoted to concerts of high-class music, while many cities, as St. Louis, San Francisco, Baltimore, Philadelphia, Milwaukee, and Pittsburg contain a sufficient number of orchestral players to give symphony concerts.

**Musik-Drama.** Art-work in which poetry, music, action, and scenery co-operate on a basis of interdependence to achieve dramatic expression; so called by Wagner in distinction from OPERA (q.v.).

**Musk.** Strong smelling, brownish, inflammable substance from the MUSK DEER (q.v.), used in perfumery. The odor is due to the slow decomposition of some undetermined constituent and not to a volatile oil. Artificial musk is obtained by treating butyl-toluol with nitric and sulphuric acids. Inferior and adulterated articles are often sold for the genuine. It is also used in medicine as a nervous stimulant.

**Musk-Deer.** Small hornless deer, 3 ft. long, 20 in. high, found in mountains of e. Central Asia. The color is dirty brown, the tail very short, the hind toes long, and the canines of the male developed as tusks. The male also has scent glands near

tail and back of navel. The musk, ab. 1 oz., worth $7, is found in the latter. These deer are captured in traps. The young are born in May after 6 months' gestation.



Musk-Deer (*Moschus moschiferus*).

**Muskegon.** City of M. co., Mich., on M. River; chartered 1861–70. It has extensive manufactures of lumber and iron. Pop., 1890, 22,702.

**Musket.** Fire-arm for infantry soldiers, which succeeded the arquebuse. The first were match-locks, then wheel-locks, which were superseded by flint-lock and percussion muskets. The term is retained for the rifled small-arm of the infantry soldier. The foot soldier so armed was formerly called a musketeer.

**Muskingum River.** In Ohio; branch of the Ohio which it joins at Marietta. Length 112 m., drainage area 8,016. It is navigable to Dresden, 91 m.

**Muskit-Grass.** American grasses of the genus *Bouteloua*, widely distributed, most abundant in the Rocky Mountain and Pacific regions.

**Musk-Ox,** or MUSK-SHEEP (OVIBOS MOSCHATUS). Arctic sheep of N. America; its remains are found in Europe as far s. as France. Its length is 8 ft., height 3 ft. The tail is short. The broad horns meet at their bases, and then bend down, outward,

Musk-Ox.

and upward. The pelage, colored dark amber, consists of lighter-colored wool, very close in the back, and long hair on the sides. This is shed in summer. Its flesh has a musky smell, especially strong in old males during the rut, in August. Ten to twenty females herd with each male. A full-grown animal weighs 450 lbs. They are most abundant on the Mackenzie River. They feed on mosses, leaves, and underbrush, and are very nimble.

**Musk-Plant.** *Mimulus moschatus.* Musky-smelling, yellow-flowered herb of the natural family *Scrophulariaceæ*, native of w. N. America; often cultivated as a curiosity; also *Erodium moschatum*, low herb of the Geranium family, native of Europe.

**Muskrat** (MUSQUASH). Large water rat, resembling the beaver, but with compressed tail ab. 7 in. long, and body a ft. long. The pelage is glossy brown, with dense underfur. The young

Muskrat (*Fiber zibethicus*).

are darker. The hind feet are partly webbed. The ears are buried in the fur. They have six mammæ, and are secretive and timid, building burrows usually in banks with the opening under water.

**Musk-Sheep.** See MUSK-OX.

**Muspratt,** JAMES SHERIDAN, 1821–1871. English chemist. *Qualitative Analysis*, 1849; *Dict. Chemistry*, 2 vols., 1854.

**Musquash.** *Cicuta maculata.* Tall, white-flowered, poisonous swamp herb of the Carrot family, native of N. America and Europe.

**Musquash.** See MUSKRAT.

**Mussafia,** ADOLF, b. 1834 in Dalmatia. Prof. Vienna; writer on philology.

**Mussel.** See UNIONIDÆ and MYTILIDÆ.

**Musset,** LOUIS CHARLES ALFRED DE, 1810–1857. French poet, dramatist, and novelist. *André del Sarto*, 1833; *Confession d'un Enfant du Siècle*, 1836. *Works*, 10 vols., 1876.

**Mustang.** See HORSE.

**Mustapha II.,** 1664–1704. Sultan of Ottoman empire 1695–1703; defeated by Austrians at Zenta 1697. Hostilities were ended by the peace of Carlowitz, Jan. 1699.

**Mustard,** BLACK. *Brassica nigra.* Yellow-flowered herb of the natural family *Cruciferæ*, native of the Old World, but widely dispersed in America as a weed or by cultivation. It becomes a bad weed in cultivated crops, especially barley, oats, and clover. It is an annual, but the seed retains its vitality so long in the ground that it is very difficult to clean land which has become infested. The seeds of the black and of the white mustard are ground as a condiment and are often adulterated with wheaten flour.

**Mustard,** HEDGE. Plants of the genus *Sisymbrium*, especially *S. officinale*, a yellow-flowered weed of the Mustard family, native of Europe, introduced into N. America.

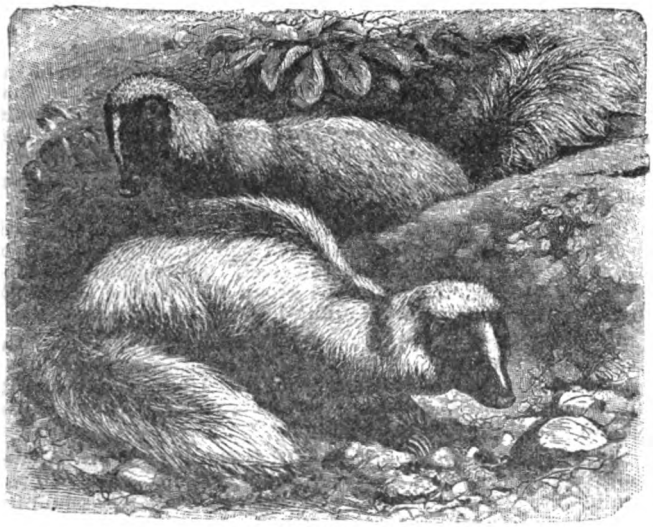
**Mustard,** MITHRIDATE. See PENNY CRESS.

**Mustard,** TREACLE. Yellow-flowered herbs of the genus *Erysimum*, natural family *Cruciferæ*, of wide geographical distribution. *E. cheiranthoides*, of the n. temperate zone, is known as Wormseed Mustard.

**Mustard Oil.** The mustard oils are the organic salts of isosulphocyanic acid, H.N:C:S. The common mustard oil is allyl isosulphocyanate, $C_3H_5$.N:C:S. It is prepared by distilling the seeds of mustard with water. It imparts the distinctive properties to mustard; and is made artificially by the action of carbon bisulphide upon allyl amine.

**Mustelidæ.** Family of *Arctoidea*, characterized by having one upper and two lower molars on each side; the last upper premolar is carnassial. Strong scent glands are usually present. They are semiplantigrade to digitigrade: the BADGER (q.v.) is truly plantigrade. America has also the Skunk (*Mephitis*), whose anal glands secrete the most penetrating and offensive odor known. Its bite sometimes produces rabies. Its color is variable black and white. In this family are also included the Otters (*Lutra* and *Enhydris*), the Martens and Sables (*Mustela*),

Weasel and Ferret (*Putorius*). Also the Minks, Ermine and Wolverine.



Skunks (*Mephitis suffocans*).

**Mut.** Egyptian goddess; wife of Amon.

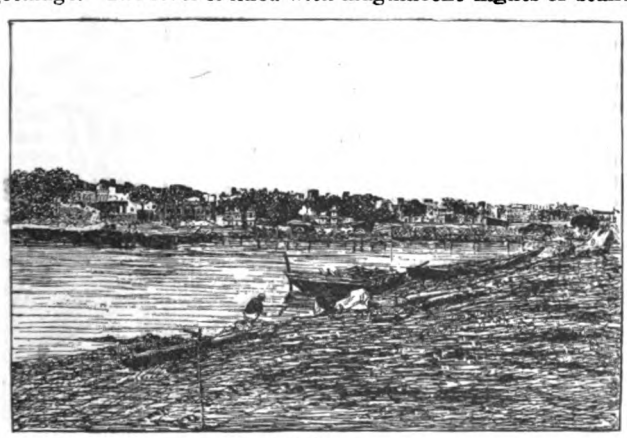
**Muta Nzige.** Lake discovered in 1876, by Stanley, in Africa and renamed Albert Edward Nyanza by him in 1889.

**Mutilata.** Section of *Mammalia*, including the orders *Sirenia* and *Cetacea*, they having no hind limbs. These groups are also sometimes united under the common term *Cetacea*.

**Mutiny,** INDIAN. It broke out at Meerút, May 10, 1857, soon spread through the n.w. provinces, Oude, and into Lower Bengal; but was repressed by anticipation in the Punjab. The native armies of Madras and Bombay did not join the insurrection. The immediate occasion of the uprising was the rumor spread among the sepoys that cartridges had been served out greased with the fat of animals unclean to both Hindoos and Mohammedans. The most serious outbreaks were at Cawnpore, Lucknow, and Delhi. The sepoys in each case rose on their officers without warning. Europeans were massacred. The garrison at CAWNPORE (q.v.) surrendered to Nana Sahib, with promise of safe conduct for women and children, but boats on which they embarked were immediately abandoned by their crews, and fired on from the river-bank. Only one boat with four men escaped. Lucknow was besieged from July 1 to Sept. 8, when it was relieved by Havelock and Outram, who were again invested by the rebels; the final deliverance was effected Nov. by Sir Colin Campbell. Delhi was recovered Sept. 20. Fighting continued till 1859. These events led to the suppression of the E. India Co., and to an act transferring the entire administration of India to the crown. Peace was proclaimed July 8, 1859.

**Mutsu Hito,** b. 1852. Mikado of Japan since 1867. His reign has been the most memorable in modern Oriental history, as witnessing the new birth of a nation, rapidly advancing from comparative obscurity to a place among civilized powers.

**Muttra.** Town of n. India, on the Agra; sacked 1017, and repeatedly plundered; held by Britain since 1803; place of pilgrimage. The river is lined with magnificent flights of stairs,



Muttra

leading to the bathing in the sacred river. Troops of monkeys and turtles are supported by the charity of the people. Pop., 1891, 61,195.

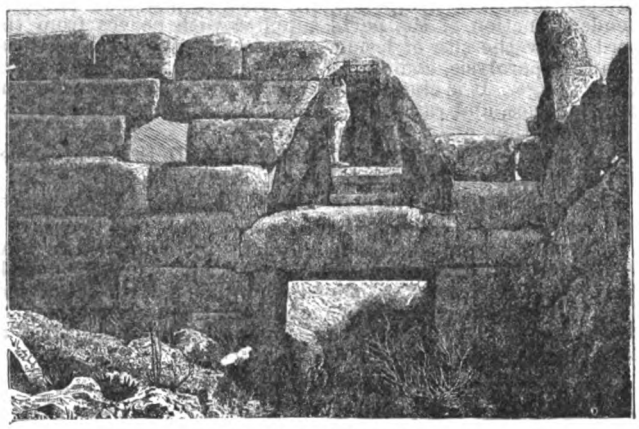
**Mutual Induction.** Electric induction, which takes place mutually between two conductors, in one of which a current is flowing whose strength is made to vary by any means. See SELF-INDUCTION.

**Mutule.** Rectangular block under a Doric cornice.

**Mycăle.** Hill in Ionia, opposite Samos; scene of a Greek naval victory over Persians 479 B.C., on the same day as the battle of Platæa.

**Mycelium.** Vegetative organ of *Fungi*. It generally consists of a system of branched threads or hyphæ.

**Mycenæ.** Greek city of Argolis in Peloponnesus, destroyed by Argos 468 B.C. Capital of Agamemnon's kingdom, and once the chief city of Greece; famed for its cyclopean walls and their lion-gate, the bee-hive tomb known as the Treasury of Atreus, and the royal tombs on the Acropolis opened by



Lion's Gate at Mycenæ.

Schliemann 1876. An entire room in the Museum of Athens is filled with the treasures and antiquities buried in these tombs. They bear no resemblance to later Greek art, but have, like that art, close relations to Egyptian style. Hence the belief that this culture was that of the CARIANS (q.v.).

**Mycerinus.** Menkera, son of Shufu (Cheops), and builder of the third of the great Pyramids of Gizeh; so called by Herodotus.

**Mycetes.** Genus of S. American monkeys, noted for their loud yells produced in chorus morning and evening; hence called Howlers. The tail is greatly developed, and is used as a fifth hand. They are untamable and very ferocious. They live in tree-tops, feed on fruits, and are eaten and considered very palatable by the natives. They have special resonance chambers in the larynx and the expanded hyoid bone.

**Mycetozoa.** Class of *Gymnomyxa*, including protozoan-like organisms which form amœboid colonies upon moist and decaying wood. The colonies may grow to a size of nearly a foot in diameter. They are usually treated by botanists as the Slime Moulds or fungoid Protophytes. There are three orders, *Sorophora*, *Endosporea*, and *Exosporea*. See MYXOMYCETES.

**Mycology.** That branch of Botany which relates to FUNGI (q.v.). While the larger fungi, as MUSHROOMS (q.v.), puff-balls, and the like, were objects of wonder and superstition from early times, it was not until the compound microscope came to considerable perfection in the present century that Mycology could claim a place as one of the branches of botanical science. Before 1850 the lower cryptogams were little understood. Before that date the brothers Tulasne published their studies of rusts and smuts, followed 1853 by the ergot of rye. On the appearance of their *Selecta Fungorum Carpologia*, 1861–65, Mycology was soon recognized as an attractive field for students, and other botanists gave their attention to fungi. From the economic standpoint, with the establishment of the Agricultural Experiment Stations in U. S., there came the opportunity for investigating various diseases of crop plants, many of which at first were only suspected of being of fungous origin. Several Experiment Stations have trained investigators in this direction. European Experiment Stations have for a longer time pursued similar lines of study, and have made correspondingly greater advances. As a logical sequence, there came the searching for ways and means for checking the fungi preying upon the crops. A better understanding of the habits of these parasites has led to better methods of culture, but more particularly to the discovery of fungicides and the proper application of these substances for the relief of the crop-growers. The salts of copper have proved effective, especially the sulphate, when mixed with lime in the proportion of four pounds of the former

to six of the latter, and diluted with from 20 to 50 gals. of water. The use of this and other fungicides is becoming so general that machines for their application in a fine spray to the affected plants are to be found upon the market in many forms.

**Mycorhiza.** Dense sclerotic mycelium of certain *Fungi* which invest the roots of trees, as Oaks, Willows, and Pines; credited with the function of absorbing for these trees the fluids within the soil, thus taking the place of root hairs, whose development the fungus suppresses.

**Myctodera.** See SALAMANDRINA.

**Myelitis.** Inflammation of the spinal cord. The term is generic, including various forms of a more or less arbitrary character, depending upon cause, location, etc. The principal forms are acute myelitis and acute anterior polio-myelitis. Acute myelitis is acute softening of the cord, occurs at all ages, and is due to various causes, trauma, syphilis, exposure to cold, etc. The symptoms are more or less pain and suspended function of the parts supplied with nerves from the cord below the site of lesion. Acute anterior polio-myelitis, infantile paralysis, commonly occurs in children under three years of age. It is characterized by fever, loss of power in certain muscles, and rapid atrophy. The cause is attributed to cold, dentition, and over-exertion.

**Myer,** ALBERT JAMES, 1827–1880. Chief U. S. signal officer 1863–64 and from 1866.

**Myers,** FREDERIC WILLIAM HENRY, b. 1843. English poet and essayist. *St. Paul*, 1867.

**Myidæ.** Family of Lamellibranchs, including forms having valves that gape at each end, a weak hinge, and the mantle almost closed, leaving a slit for the protusion of the cylindrical foot. They have long siphons, and bury themselves in mud or sand. This group includes the common Long Clam (*Mya*) of the New England coasts.

**Mylitta.** Babylonian goddess of lewdness.

**Mylodon.** See MEGATHERIUM.

**Myoblasts.** Cells in jellyfish which transform a portion of their substance into muscle-fiber.

**Myocarditis.** Inflammation of the heart muscle, rarely a primary disease; it is generally associated with endo- or pericarditis, embolism, and diseases of the blood-vessels of the heart, rheumatism, and the infectious fevers.

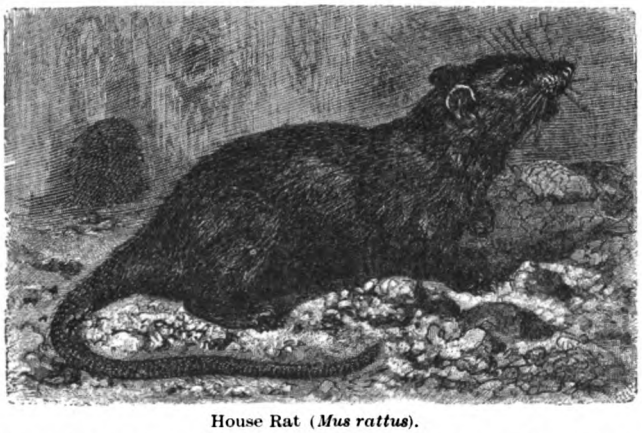
**Myocommata.** See MYOTOMES.

**Myocyte.** Cell which is muscular in function. In sponges are found such cells in the chones and around oscula and pseudoprocts.

**Myoepithelial Cell.** Epithelial cell that exercises also a muscular function.

**Myology.** Branch of Anatomy which treats of the muscles. When homologous muscles of different animals are studied systematically, it is Comparative Myology.

**Myomorpha** (MICE). Section of the order *Rodentia*, including the *Muridæ* (Rats, Mice, Hamsters, Voles, Lemmings, etc.), *Myoxidæ* (Dormice), *Spalacidæ* (Mole Rats), *Geomydæ* (Pouched Rats), and *Dipodidæ* (Jerboas). They have usually three molars in each half jaw, scaly tail, and cleft upper lip.



House Rat (*Mus rattus*).

The Mole Rats are Old World forms, with the habits and appearance of the Mole. The Jerboas of Europe, Jumping Hares of Africa, and Jumping Mice of N. America, have long, hairy tails and disproportionately long hind legs, which enable them to leap great distances. About 300 living species of *Muridæ* are known. The genus *Mus* includes Rats, Mice, Field and Harvest Mice.

**Myophan Layer.** Contractile inner layer of the ectosarc of cells (especially *Infusoria*).

**Myoporinaceæ.** Natural family of flowering plants, of the class *Angiospermæ*, sub-class *Dicotyledons*, and series *Gamopetalæ*, comprising 5 genera and ab. 78 species, occurring especially in Australia.

**Myopsidæ.** See DECAPODA and DIBRANCHIATA.

**Myopy.** Shortsightedness; habitual accommodation of the eye for distances shorter than that of ordinary vision, so that distant objects are not focused on the retina and appear indistinct. The usual cause is the too great convexity of the lens parts of the eye. Myopy is corrected with diverging glasses.

**Myotomes.** Muscular parts of the somites, or protovertebræ.

**Myriapoda,** or MYRIOPODA. *Tracheata* with elongated, worm-like body, distinct head, one pair of antennæ, two or three pairs of jaws, and numerous feet. The segments behind the head are nearly alike. The group includes the *Chilopoda* (Centipedes), *Chilognatha* (Millipedes), and *Pauropoda*.

**Myricaceæ.** Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Dicotyledons*, including 2 genera and ab. 40 species of shrubs and trees, widely distributed throughout the temperate and warmer portions of the earth; called the Sweet-Gale family.

**Myricyl Alcohol.** $C_{31}H_{63}.OH$. This alcohol is combined with palmitic acid in beeswax and Carnauba wax. It is a white solid and is obtained by the action of hot potassium hydroxide solution upon these waxes.

**Myrionemeæ.** Family of brown *Algæ* of the order *Ectocarpaceæ*, of marine distribution.

**Myriotricheæ.** Family of brown *Algæ*, of the order *Ectocarpaceæ*, of marine distribution.

**Myristiceæ.** Natural family of flowering plants, of the class *Angiospermæ*, and sub-class *Dicotyledons*, including one genus and ab. 90 species, natives of the tropics of America, Asia, Africa, and Australia.

**Myrmidons.** Achæans in Thessaly, whom Achilles led to Troy. According to legend, they originated in Ægina, when Zeus changed ants into men.

**Myron.** 5th cent. B.C. Greek sculptor, associate of Phidias. The *Disk-thrower* of the Vatican is the best known copy of a famous but now unknown bronze original. His bronze cow was celebrated; no copy exists.

Myrrh (*Balsamodendron myrrha*).

**Myrrh.** The myrrh of Scripture was the resin of shrubs of the genus *Cistus*, natural family *Cistaceæ*, and of *Balsamodendron myrrha*, a small tree of e. Africa. The Garden Myrrh is *Myrrhis odorata*, an herb of the Carrot family, native of Europe, cultivated for its aromatic odor.

**Myrsinaceæ.** Natural family of flowering plants, of the class *Angiospermæ*, sub-class *Dicotyledons*, and series *Gamopetalæ*, comprising 24 genera and ab. 550 species, distributed throughout the tropical and warm regions of the earth.

**Myrtaceæ.** Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Dicotyledons*, comprising ab. 87 genera and ab. 2,400 species of trees and shrubs, growing especially in the tropical regions of both hemispheres.

**Myrtle.** *Myrtus communis*. Small tree of the natural family *Myrtaceæ*, native of w. Asia, cultivated in warm countries for ornament. In the U. S. the Periwinkle (*Vinca minor*).

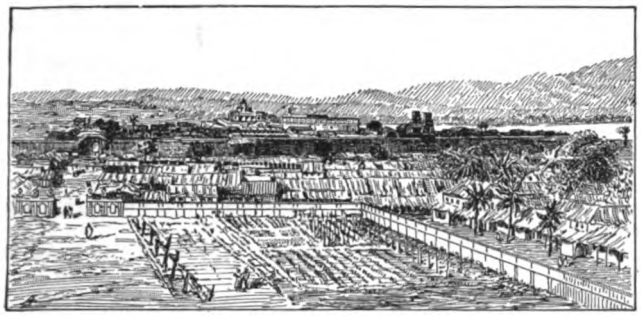
Myrtle (*Myrtus communis*).

**Mysia.** District of n.w. Asia Minor, early settled by a Thracian race. With Lydia formed the 2d Satrapy of the

Persian Empire. It was bequeathed to Rome by Attalus III. of Pergamus 133 B.C.

**Mysis.** See SCHIZOPODA.

**Mysore.** City of s. India, 245 m. s.w. of Madras; capital



View of the Town of Mysore.

of a native state. It is a prosperous, well built town, having substantial houses and public buildings. Pop., 1891, 74,048.

**Mystacoceti,** or MYSTICETE. Sub-order of *Cetacea*, including the *Balænidæ*. The Rorqual and the Greenland or Right Whale are examples of this family. See BALEEN-WHALE.

**Mystagogue.** Initiator into ancient Greek mysteries.

**Mysteries.** Religious rites held at various points in the Greek world, particularly at Samothrace and Eleusis; celebrated at night. The secrets there revealed were kept inviolate, although all Greeks were entitled to receive them. No description of them has come down, which indicates how deep a hold they had upon the Greek mind and conscience. We can only gather their general significance from allusions in ancient authors.

**Mysteries.** Dramatized stories from the Bible or Apocryphal Books, acted in England 1100-1400. See MIRACLE-PLAYS.

**Mysticete.** See MYSTACOCETI.

**Mysticism.** Doctrine that God and his will can be immediately known by man, and thus distinctly contrasts with the method of science. It implies an exalted state of feeling, which aims at personal communion with Deity; found in many ages and religions, especially in Buddhism, Neoplatonism, and Christianity. Though often abused to fanaticism, it properly characterizes saints like Bernard of Clairvaux, Fenelon, and the author of the *Imitation of Christ*. QUIETISM (q.v.) is one of its forms. Notable examples were John of Chur, d. 1380, the Brethren of the Free Spirit and of the Common Life, Eckhart, Tauler, and in later times Jacob Boehme, Molinos, Mme. Guyon, Mme. Bourignon, Wm. Law, Swedenborg, and Rosmini. Paracelsus, Spinoza, Bruno, and Hegel represent a more philosophic tendency of mysticism.

**Mythology.** Imaginative forms in which the religious apprehensions, especially of pagan nations, clothe themselves. There is commonly a dim conception of God as One, but distant, while his various attributes, or his modes of working in nature, are conceived more or less distinctly as individual divine personalities. This humanization of the Divine forces was most complete among the Greeks, though even here there was a good deal of confusion between different divinities. Zeus or Jupiter (a personification of the bright æther) is supreme, with his spouse Heré or Juno, the variable lower sky. Around them are Apollo and Artemis, originally Sun and Moon; Pallas Athené, the enlivening air, goddess of wisdom; Vesta, the flame of the hearth, and Hephaestus, or Vulcan, the flame of the forge, god of art; Ares, or Mars, once, perhaps, the dark storm-cloud, now god of rude war; and many others, from rank, like that of Poseidon or Neptune, hardly inferior to Jupiter, down to the Hamadryads, who died with the trees they inhabited. Their characters were as various as their attributes, but holiness, righteousness, or benignity, in the Christian sense, appears at most in uncertain gleams, and behind them all is the blind Fate from which they are imperfectly disengaged, and into whose absorbing power, like the dynasties of ruder forces preceding them, they are always in danger of falling back.

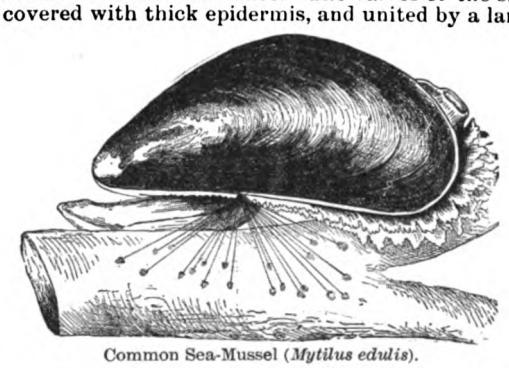
The Teutonic mythology is like the Græco-Roman, but purer, though ruder and less completely personalized. Woden, or Thor, is supreme, meaning the storm or thunder. Yet the brighter forces appear, as Freya, goddess of love, or the benignant Balder, god of the summer sun, who, brought treacherously low to Hela, the icy goddess of death, shall yet reign over a delivered and purified world, when Woden and Thor, with all Valhalla, have disappeared.

The Hindu mythology, in its main deities, Brahma, Vishnu (in his manifold incarnations), and Siva, with their feminine counterparts, is more a personalization of metaphysical attributes of the Godhead than of physical forces. The Babylonian and Syrian worship, which was grossly libidinous and cruel, was largely founded on association of the heavenly bodies. Baal representing Jupiter or the Sun, Ashtoreth Venus or the Moon, the gloomy Molech Saturn, and so forth. The Mexican mythology rested on the same general principles, modified by differences of climate and situation; but, though originally mild, had become hideous by the superimposition of Aztec cruelties.

The formless mythologies of savage and barbarous tribes are innumerable. Christianity has not destroyed mythology, but has reduced it to a purified and harmless play of the fancy.

**Mytilene.** City of LESBOS (q.v.); birthplace of Sappho.

**Mytilidæ** (SEA-MUSSELS). Heteromyarian *Lamellibranchs*, with a short siphon produced by the union of the lips of the mantle-lobes for a short distance. The valves of the shell are equal, covered with thick epidermis, and united by a large pos-



Common Sea-Mussel (*Mytilus edulis*).

terior and a small anterior adductor muscle. The tongue-shaped foot secretes a byssus. Many species are used as food. Horse Mussels and Black Mussels are familiar examples. They stick fast in thick masses along the water level on the edges of the marsh-lined creeks of our coasts.

**Myxa.** Point of the lower jaw of the beak of birds.

**Myxamœbæ.** Amœboid cells of which a plasmodium consists.

**Myxinoidæ** (HAG-FISHES). Family of Cyclostome fishes, including forms having a suctorial mouth, with labial processes, and eyes hidden beneath the skin. The nasal cavity opens through the palate into the mouth. The branchial sacs open either by separate apertures or by a common aperture on each side. *Myxine* is parasitic on fish, and may even live endoparasitic in the cod, eating through the body wall of its host.

**Myxomycetes.** Sub-class of *Fungi* in the vegetative state; plasmodium consisting of naked masses of protoplasm, ultimately producing sporanges containing the propagating spores; called Slime Moulds. The group is sometimes claimed for the animal kingdom under the name *Mycetozoa*.

**Myxospongia.** Soft fleshy sponges that have no skeleton. The ectoderm cells bear flagella. *Halisarca* is an example.

**Myxosporidea.** Sub-class of *Sporozoa*, including Gregarines, with a many-nucleated euglenoid phase. The spores (psorosperms) have a thick coat containing thread-cells. Each spore hatches into several amœbulæ.

**Myzostomida.** Group of *Vermes*, including only *Myzostoma*, a genus of small disk-shaped hermaphrodites, parasitic upon Crinoids. They produce cysts on the integument that look like galls. They have four pairs of ventral suckers, five pairs of parapodia armed with hooks, etc., and a protrusible proboscis. Circulatory, respiratory, and excretory organs are absent. The intestine is branched, and the ova escape by the anus.

# N

**Naaman.** Syrian general, healed by Elisha of leprosy.

**Nabatæans.** Tribe mentioned Isa. lx. 7, I. Maccabees v. 25, ix. 35, etc. They succeeded the Edomites, occupying Idumæa and part of Arabia Proper, and were subjugated by the Romans 105. Petra was their stronghold.

**Nablar.** Mathematical sign, the capital Greek letter delta inverted, $\nabla$; known as Hamilton's Operator. The equation $\nabla=0$ indicates an important relation in all physical sciences.

**Nablous.** Town of middle Palestine, between Mounts Ebal and Gerizim; the ancient Shechem.

**Nabob,** or NAWAB. Orig., viceroy of a province in India; then any Anglo-Indian merchant returned to spend his wealth in England.

**Nabonassar.** King of Babylon 747 B.C. At that date began an era named from him.

**Naboth.** Neighbor of Ahab and victim of Jezebel (I. Kings xxi.).

**Nachtigal,** GUSTAV, M.D., 1834–1885. German explorer of n. Africa 1869–74; Consul at Tunis 1882; Commissioner of Annexation 1884. *Sahara and Soudan*, 1879.

**Nacre.** Mother-of-Pearl. See AVICULIDÆ.

**Nadal,** EHRMAN SYME, b. 1843. American author. *London Social Life*, 1875; *Zweibak*, 1887.—His father, BERNARD HARRISON, D.D., 1812–1870, was prof. in Drew Sem. from 1867.

**Nadaud,** GUSTAVE, 1820–1893. French lyric poet.

**Nadir.** Point where the plumb-line, produced downward, pierces the celestial sphere; opposite to the zenith.

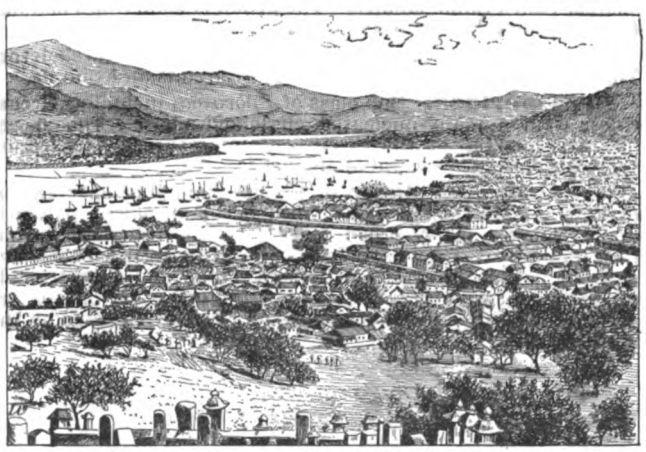
**Nadir Shah,** 1688–1747. Robber-chief of Khorassan, who expelled the Afghans from Persia 1727–30, deposed Shah Tamasp 1732, and was crowned 1736. He invaded Hindustan, pillaged Delhi, restored the ancient limits of Persia by other conquests, and was noted for vigor, greed, and cruelty.

**Naefels,** or NÖFELS. Village of Canton Glarus, near which 400 Swiss peasants defeated 15,000 Austrians April 1388.

**Nævius,** GNÆUS, ab.265–ab.200 B.C. Second great Latin writer. Fragments remain of his epic on the Punic War, with the titles of over thirty comedies. He imitated the political satire of the Old Attic Comedy, and was imprisoned for his boldness. For a second offense he was banished to Utica, where he died.

**Nævus.** See BIRTHMARKS.

**Nagasaki.** Seaport of Kiushiu, Japan, on an inlet of the w. coast. In 1859 it became one of the 5 open ports; for over



Bird's-eye View of Nagasaki.

200 years it was the only port where foreigners were allowed to land. It has the oldest hospital in Japan, and a government school, attended by natives of all classes to learn the languages and sciences of Europe. Pop., 1890, 58,100.

**Nagel,** ALBRECHT EDUARD, b. 1833. Prof. Tübingen 1867; writer on ophthalmology.

**Nägelsbach,** KARL FRIEDRICH, 1806–1859. Prof. Erlangen 1842. *Lateinische Stilistik*, 1846; *Homerische Theologie*, 1857.

**Nagle,** JAMES, 1822–1866. Brig.-gen. U. S. Vols. 1862–63.

**Naglee,** HENRY MORRIS, 1815–1886. Brig.-gen. U. S. Vols. 1862–64.

**Nagoya.** Manufacturing city of Japan, near Bay of Owari. Pop., 1892, 179,174.

**Nagpur.** City of British India, 450 m. e.n.e. of Bombay; annexed 1853; scene of a British victory Nov. 1817. It has considerable manufactures of coarse cotton and woolen goods, brass, and copper. Pop., 1891, 117,014.

**Nag's Head.** Tavern at Cheapside, London, where Abp. Parker and others were falsely said to have been consecrated.

Nag's Head.

This was really done in due form at Lambeth, Dec. 17, 1559: the fable was invented ab.1600.

**Nagualism.** Cult of Indian tribes of Mexico and Central America, frequently mentioned by early Spanish writers; described as still existing, though much modified by Christianity. Its rites are performed in secret. Intoxication of some kind is regarded as an essential part. Its devotees are said to be able to transform themselves into animals. Its most important symbols are fire, the tree, and the serpent.

**Nagyagite.** Rich ore of gold and lead combined with antimony, sulphur, and tellurium; also called foliated tellurium and black tellurium; found originally at Nagyag, in Transylvania; reported from other localities where tellurides occur.

**Nahant.** Watering-place on Mass. coast, 12 m. n.e. of Boston.

**Naharro,** BARTOLOMÉ DE TORRES, b. ab. 1490. Spanish dramatist and poet.

**Nahuatt.** See AZTECS.

**Nahum.** Hebrew prophet ab. 650 B.C.; author of 34th O. T. book.

**Naiadaceæ.** Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Monocotyledons*, comprising 16 genera and ab.120 species, of wide geographic distribution in fresh water and marshes; called the Pondweed family.

**Naiads.** See NYMPHS.

**Nailing Blocks.** Blocks of wood inserted in a brick wall, upon which boards are to be nailed.

**Nails.** Cut nails are sold by the keg of 100 lbs. at $1.50 per keg. One pound contains 300 fourpenny, 163 sixpenny, 93 eightpenny, or 50 twelvepenny nails. The holding power of a twelvepenny nail varies from 800 to 1,600 lbs., according to the kind of timber. Wire nails are sold at $1.65 per keg.

**Nain.** 1. Village of Galilee, near Nazareth, where Christ raised the widow's son. 2. Moravian mission in e. Labrador.

**Nairne,** CAROLINA OLIPHANT, BARONESS, 1766–1845, m. 1806. Author of 87 Scottish songs, including *Land o' the Leal, Laird o' Cockpen,* and *Caller Herrin'*.

**Nais.** See LIMICOLÆ.

**Najac,** ÉMILE, COMTE DE, b. 1828. French playwright.

**Najara,** or NAVARETE. In n. Spain; scene of a victory gained April 3, 1367, by Don Pedro, assisted by Edward the Black Prince, over Enrique de Trastamara and the French under Du Gueschin. Don Pedro the Cruel was replaced on the throne of Castile.

**Nakhimov,** AKIM, 1782–1815. Russian poet.

**Nakoo.** Another name for GAVIALS (q.v.).

**Namaland,** or NAMAQUALAND, GREAT. Region of S. Africa n. of Cape Colony; held by Germany since 1885. The natives are Namaquas, or Hottentots.

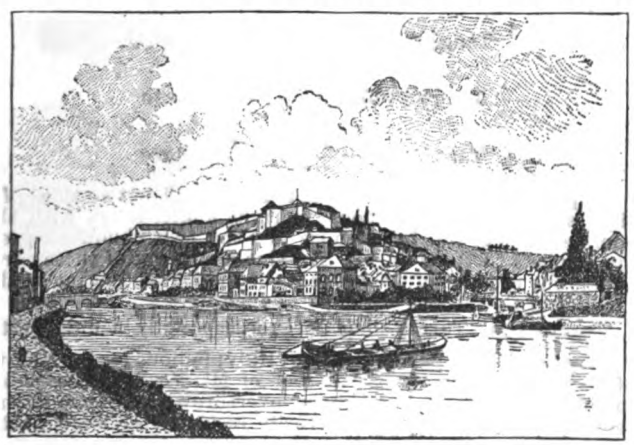
**Namatianus,** RUTILIUS CLAUDIUS, 5th cent. Latin poet, whose *De Reditu suo* (from Rome to Gaul) survives in part.

**Namdinh.** City of Tonquin, near the Song-koi. The French have interests here. Pop. ab. 50,000.

**Names.** (*a*) Those *of Persons* are of various origin. Class or tribes, and even nations, called themselves "the people" (so *Deutsch*) and other tribes "strangers" (so *Welsh*). Distinctive names came from strangers; so the Celts probably called their neighbors *Germans*. Old names of tribes, moreover, followed the totem—sun, bear, or whatever object. Many English names still keep up the animal origin. Patronymics, too, are common for persons, as English *-ing, -son,* or the simple *-s* of the possessive case. Personal nicknames, trades, and the like supplied the commoner names; but connection with a place by *of*—like *von* and *de*—is of nobler descent. Sir Richard at the Lee, in the Robin Hood ballads, shows us the origin of Atlee. (*b*) *Names of Places* are mainly descriptive. In Europe, rivers, mountains and so on are often Celtic; but names are pointed out which were given before the Aryan invasion of Europe. Often popular etymology plays its part, disguising the ancient name in a modern word of similar sound.

**Names,** IN LAW. One may change his name at will, although authority therefor is frequently obtained from the legislature or the courts.

**Namur.** Town of Belgium; on the Meuse. 35 m. s.e. of Brussels; taken by the French 1692; retaken by William III. of



Namur.

England 1695; again taken by the French 1746, 1792, and 1794. It manufactures leather, paper, tobacco, and cutlery, the last of superior quality. Pop., 1891, 30,674.

**Nana Sahib** (DUNDHU PANTH), b. ab. 1821. Leader in the Indian mutiny of 1857; proclaimed Peshwa by the mutineers; responsible for the Cawnpur massacres. He fled to Nepal, and eluded further knowledge.

**Nancy.** City of n.e. France, on the Meurthe, 29 m. s. of Metz; once capital of Lorraine. Charles the Bold of Burgundy took it Nov. 29, 1475, lost it Oct. 5, 1476, and was defeated and slain here Jan. 5, 1477. Stanislas, ex-king of Poland, lived here 1735–46, and did much for its adornment. Blücher took it Jan. 1814. It is beautifully built, contains numerous institutions of learning, and has considerable trade and manufactures. Pop., 1891, 87,110.

**Nanek,** 1469–1539. Enthusiast and reformer of n.w. India; founder of the Sikhs. He sought to reconcile the teachings of Mohammed with those of Buddha.

**Nanking.** City of China, on the s. bank of the Yangtse Kiang, 100 m. from its mouth; founded 1368; held 1853–64 by the Tai-ping rebels, who destroyed many of its edifices. It is the chief seat of learning of China, and has silk, paper and cotton manufactures. Pop. ab. 200,000.

**Nannarelli,** FABIO, b. 1825. Italian poet, prof. Milan 1860, Rome 1870.

**Nanny-Berry.** See SHEEP-BERRY.

**Nansen,** FRIDTJOF, b. 1861. Norwegian arctic explorer. He crossed Greenland 1888–89, started on a voyage to the North Pole June 1893, and returned Aug. 1896, having made important discoveries, and reached lat. 86° 15′, a point nearly 200 m. further n. than either Nares (1876) or Greely (1882). *Eskimo Life,* 1893.

**Nan-shan Mountains.** High range of Central Asia, on n. border of plateau of Thibet.

**Nantes.** City and port of France, on the Loire, 30 m. from its mouth. It has a large commerce and manufactures, and

Nantes.

many fine buildings; the cathedral was begun 1434, the castle rebuilt 1466. Hundreds were slaughtered here by J. B. Carrier 1793 in the infamous NOYADES (q.v.). Pop., 1891, 122,750.

**Nantes,** EDICT OF. Granted by Henry IV. 1598, securing limited freedom to French Protestants; revoked by Louis XIV. 1685.

**Nanteuil,** ROBERT, 1630–1678. French copper-plate engraver and draughtsman in crayons. He particularly excelled in engraving portraits. Louis XIV. honored him by an edict declaring engraving a profession distinct from the mechanical arts and conveying the rank and privileges accorded to other artists.

**Nanticoke.** Town of Luzerne co., Pa., in the coal region on the Susquehanna, 8 m. s.w. of Wilkesbarre. Pop., 1890, 10,044.

**Nantucket.** Island of Mass., s. of Cape Cod. Length ab. 15 m.; area nearly 60 sq. m.; formerly a port for the whale fishery, now a seashore resort.

**Naos.** Body of a Greek temple, as distinguished from its portico (pronaos). It consists of blank walls, relieved only by small and inconspicuous entrances, and, in some cases, of a sculptured frieze at the top.

**Napata.** Ancient Ethiopian capital, now Gebel Barkal; on the Nile, below the 4th Cataract.

**Naphtali.** Sixth son of Jacob, and ancestor of one of the 12 tribes of Israel.

**Naphtha.** Mixture of hydrocarbons, obtained in the distillation of crude petroleum, with lower boiling point than that of the safe illuminating oil. It contains heptane, octane, and nonane. That of 62° B. is used with oil paints, of 68° B. for cleansing purposes, and of 75° B. for stoves. The mixture of all is used to enrich illuminating gas. As a mineral product, the name is applied to petroleum that is light in color and

low in specific gravity; but natural naphtha in this form is not of frequent occurrence.

**Naphtha Engine.** Of the explosive vapor type (see GAS ENGINE), in which naphtha is vaporized by having air at considerable pressure blown through it, and the mixed air and hydrocarbon spray is ignited behind the working piston by a small flame. Such engines are adapted for use afloat, and where gas is not available. When the engine becomes of large size, there has to be a smaller secondary engine to pump air in order to start the larger engine with a supply of compressed air. They have all the advantages of a gas engine, with an added risk from fire.

**Naphthalene.** $C_{10}H_8$. Sp. gr. 1.152, mpt. 80° C., bpt. 218° C. Solid white hydrocarbon, present in large quantities in coal tar and always obtained from it; usually formed by the decomposition by heat of carbonaceous substances; white plates of characteristic tarry odor. It sublimes and is purified in this way. Oxidizing agents change it to phthalic acid. All naphthalene derivatives are prepared from it; hence it is largely used in the manufacture of artificial dyestuffs. It is a powerful antiseptic and germicide.

**Naphthalene Blue.** $C_{18}H_{15}N_2OCl$. Blue dyestuff, prepared by the action of nitrosodimethylaniline on $\beta$-naphthol; soluble in water. It dyes cotton on a tannin mordant.

**Naphthalene Colors.** Artificial dyestuffs prepared from naphthalene derivatives.

**Naphthalene Red.** See MAGDALA RED.

**Naphthalene Sulphuric Acid.** There are two varieties, $\alpha$ and $\beta$, made by treating naphthalene with sulphuric acid. They are crystalline deliquescent compounds, used in the manufacture of dyes.

**Naphthalene Yellow.** See DINITRONAPHTHOL.

**Naphthazarin.** $C_{10}H_6O_4$. Dioxynaphthoquinone; produced by the action of zinc and sulphuric acid upon dinitronaphthalene. Combined with bisulphate of soda, it forms alizarin black.

**Naphthionic Acid.** $C_{10}H_6{:}NH_2.SO_3H(1{:}4)$. $\alpha$-Naphthylamine-sulphonic acid; needles formed by the action of sulphuric acid upon $\alpha$-naphthylamine; soluble with difficulty in water; used in making artificial colors.

**Naphthoic Acids,** $\alpha$ and $\beta$. $C_{10}H_7.COOH$. Monobasic acids derived from naphthalene by replacing hydrogen by carboxyl; known in two forms of differing constitution. The acids consist of fine white needles, soluble with difficulty in water. Upon distillation with lime they yield naphthalene and carbon dioxide.

**Naphthol Blue.** See NAPHTHALENE BLUE.

**Naphthol Green.** $C_{20}H_{10}N_2O_{10}S_2FeNa_2$. Double sodium and iron salt of the nitroso-$\beta$-naphthol monosulphonic acid, made by the action of nitrous acid on the $\beta$-naphthol acid; green powder, soluble in water.

**Naphthol Oranges.** Sodium salts of the substances produced by the action of the paradiazobenzene sulphonic acid on the naphthols; yellow substances, soluble in water, and dyeing wool a reddish yellow.

**Naphthols,** $\alpha$ and $\beta$. $C_{10}H_7.OH$. Hydroxyl derivatives of naphthalene. The naphthols are prepared by the action of caustic soda upon the salts of the naphthalene sulphonic acids, formed by the action of sulphuric acid on naphthalene. These are white solids of characteristic odor, with antiseptic properties, used in pharmacy and in the manufacture of dyestuffs.

**Naphthol Yellow.** Naphthol yellow S is a salt of $\alpha$-sulphonic acid corresponding to naphthol yellow. See DINITRONAPHTHOL.

**Naphthoquinones.** $C_{10}H_6O_2$. Products of the oxidation of various naphthalene compounds. Two distinct varieties are known. The $\alpha$ compound crystallizes in yellow rhombic tablets, mpt. 125° C.; the $\beta$ in yellow-red plates, and blackens on heating to 120° C.

**Naphthylamines,** $\alpha$ and $\beta$. $C_{10}H_7.NH_2$. $\alpha$-Naphthylamine is a solid, melting at 50° C., and of disgusting odor, produced by the action of hydrogen upon nitronaphthalene, and in many ways resembling aniline. The $\beta$-naphthylamine is prepared by the action of ammonia on $\beta$-naphthol and has no odor. Both are used in the manufacture of artificial dyestuffs.

**Napier,** SIR CHARLES, R.N., 1786–1860. British admiral 1858. He served in w. Indies, Portugal, the Mediterranean, and the Potomac, 1800–14; commanded the Portuguese fleet 1833–36; that of the Channel 1847, and of the Baltic 1854; and was M.P. 1841–46 and from 1855. *War in Portugal*, 1836; *War in Syria*, 1842.—His cousin, SIR CHARLES JAMES, 1782–1853, won fame as the conqueror of Sind 1841–43, governed it till 1847, and was Commander-in-chief in India 1849–51.—His brother and biographer, SIR WILLIAM FRANCIS PATRICK, 1785–1860, Major-gen. 1841, knighted 1848, Lieut.-gen. 1851, wrote a notable *Hist. War in Peninsula*, 6 vols., 1828–40, and *Conquest of Scinde*, 1845.

Sir William F. P. Napier.

**Napier,** JOHN, 1550–1617. Laird of Merchiston; writer on *Revelation*, 1593; ancester of the modern Napiers. Though he considered mathematics as but a recreation, he invented Logarithms, framed the Rule of Circular Parts for solving right spherical triangles, and discovered a group of relations between the elements of the oblique spherical triangle, known as Napier's Analogies.—His son ARCHIBALD, 1576–1645, was made Lord Napier 1627.

**Napier,** MACVEY, 1776–1847. Prof. Edinburgh 1824; writer on Bacon; ed. *Edinburgh Review*, 1829–46, and *Encyc. Britannica* Supplement, 1816–24.

**Napier,** ROBERT CORNELIS, LORD, 1810–1890. Anglo-Indian soldier; commander of the expedition to Abyssinia 1867–68; he was created Baron of Magdala 1868; Commander-in-chief in India 1870–76; Gov. of Gibraltar 1876–82.

**Napierian Logarithms.** System invented ab. 1594, in which the modulus is assumed as unity: the base (e) is found to be 2.718271 - - - - - -. It is best adapted to analysis.

**Napier's Analogies.** Equations used in solving the spherical triangle when two sides and their included angle, or two angles and their included side, are known. If A. B. C. represent the angles: a. b. c. their opposite sides:

$$\text{Tang}\tfrac{1}{2}(A+B)=\frac{\cos.\tfrac{1}{2}(a-b)}{\cos.\tfrac{1}{2}(a+b)}\text{cotan}\tfrac{1}{2}C \qquad (1)$$

$$\text{Tang}\tfrac{1}{2}(A-B)=\frac{\sin\tfrac{1}{2}(a-b)}{\sin\tfrac{1}{2}(a+b)}\text{cotan}\tfrac{1}{2}C \qquad (2)$$

$$\text{Tang}\tfrac{1}{2}(a+b)=\frac{\cos.\tfrac{1}{2}(A-B)}{\cos.\tfrac{1}{2}(A+B)}\text{tang}\tfrac{1}{2}c$$

$$\text{Tang}\tfrac{1}{2}(a-b)=\frac{\sin.\tfrac{1}{2}(A-B)}{\sin\tfrac{1}{2}(A+B)}\text{tang}\tfrac{1}{2}c$$

**Napier's Rule of Circular Parts.** The two sides of a right spherical triangle about the right angle, taken with the complements of the hypotenuse and the two oblique angles, are Napier's Circular Parts. The sine of any one of these parts equals the product of the tangents of the parts adjacent or the product of the cosines of the parts opposite.

**Napiform.** Turnip-shaped organs, especially biennial roots.

**Naples.** Most populous city of Italy; famous for the beauty of its situation, on its bay at foot of Mt. Vesuvius; probably founded by Greeks as Parthenope; overthrown by the Cumeans; rebuilt as Neapolis; long a favorite residence of wealthy Romans. Ravaged and laid waste during the barbarian invasions, it was restored from the 12th century on. The Normans seized it 1037. Their rights were transmitted to the Emperor of Germany. Frederic II. founded a university 1224. In 1265 the Pope conferred the kingdom of the Two Sicilies upon Charles of Anjou, who made Naples his capital, and retained it after losing Sicily 1282. In 1442 it fell to Alphonso of Aragon, and in 1504 was made subject to Spain; 1707–35 it was under Austrian dominion. In 1735 Don Carlos overcame the Austrians and founded the Spanish Bourbon dynasty, which continued in power till 1861, when Naples became a part of the kingdom of Italy. Though irregularly planned, it has streets in the main broad and well paved, many magnificent buildings, scientific

and literary institutions, art collections, a very large commerce, and some manufactures. Pop., 1893, 532,500.

View of Naples—Showing Vesuvius tranquil after an Eruption.

**Naples,** KINGDOM OF. Old political division of ITALY (q.v.).

**Naples,** SCHOOL OF. See NATURALISTS.

**Naples Museum.** Formerly the Museo Borbonico; especially rich in finds from Herculaneum and Pompeii, illustrating Greek and Roman domestic life, and in the frescoes from Pompeiian houses. It has also a series of statues found in the Baths of Caracalla and moved ab. 1780 from the Farnese Palace at Rome, as the *Farnese Bull*, *Hercules*, and *Flora*.

**Napoleon.** Game of cards, with a full pack, ranking as in whist, played by five or six persons. Five cards are dealt to each, one at a time, and the players in succession announce how many tricks they will take, or pass; declaring Nap signifies that the player will take all the tricks. If all pass, the first player stands for one trick. All play against the standhand, who has the lead, the first suit played being the trump. The cards are played in front of each player. If the standhand plays for three or less tricks and wins them, the other players pay him the same number of counters each; if he fails, he pays the same number to each. If he declares four tricks and wins, he receives eight counters, but pays only four if he fails. If he declares five tricks and wins, he receives fifteen counters and pays five if he fails.

**Napoléon,** LE CARRÉ. Game of solitaire played with two entire packs of cards. Twelve packets, each consisting of four cards dealt together, are laid out so as to form three sides of a square, leaving a space in center for the eight aces, which form the foundation cards.

**Napoleon I.,** 1769–1821. Son of Carlo and Letitia Buonaparte of Corsica; educated at the military school of Brienne 1779–84; unsuccessful adventurer till 1793, when he won distinction in the siege of Toulon, and became general of brigade; commander of the garrison in Paris Oct. 1795, where he repressed a rising. Early in 1796 he took command of the army in Italy, and married Josephine de Beauharnais. The brilliant success of his Italian campaigns, 1796–97, raised him to greatness: his expedition to Egypt and Syria, 1798–99, though a sensational fiasco, was in accord with the French temper and increased his fame. Nov. 1799 he became First Consul and ruler of France. As such he directed another war in Italy 1800–1, and displayed great administrative ability at home: the *Code Napoleon* was promulgated 1801 and later. His coronation as Emperor, Dec. 2, 1804, was preceded by the judicial murder of the Duc d'Enghien. In 1805 England, Russia, Austria and Sweden formed a coalition against France. N. crushed the Austrian army at Ulm Oct. 20, entered Vienna Nov. 13, and routed the Russians and Austrians at Austerlitz Dec. 2. Austria surrendered her Italian dependencies, over which N. set his relatives. He annihilated the Prussian army at Jena Oct. 14, 1806, took Berlin Oct. 27, and created the Kingdom of Westphalia July 1807; transferred the Spanish throne to his brother Joseph May 8, 1808; crushed Austria again 1809, and deprived her of Poland; divorced Josephine Dec. 16, 1809, and married Marie Louise, Archduchess of Austria, April 1, 1810. The Russian campaign of 1812 was his undoing; he led 500,000 men to Moscow, and brought back 25,000. Europe now rose against him; he was defeated at Leipzig Oct. 19, 1813; Paris was taken by the Allies March 30, 1814. He abdicated April 6, and retired to Elba; returned secretly March 1, 1815, was totally defeated by Wellington and Blücher at Waterloo June 18, and banished to St. Helena, where he died. His remains were removed to Hotel des Invalides, Paris, 1840. He was the greatest military genius of modern times; but his inordinate ambition, disregarding natural boundaries and attempting the impossible by overturning states and parceling out kingdoms as if they were farms, led inevitably to his downfall. Most of his work was speedily destroyed: the Code remains. He is the subject of an enormous and increasing literature.

Napoleon I. at Malmaison.

**Napoleon II.,** FRANCIS JOSEPH CHARLES, 1811–1832. Son of Napoleon I. and Marie Louise; "King of Rome"; cared for by the Austrian Emperor as Duke of Reichstadt.

**Napoleon III.,** CHARLES LOUIS, 1808–1873. Son of Louis Bonaparte, King of Holland, and Hortense Beauharnais. He attempted a revolt at Strasburg Oct. 6, 1836, and another at Boulogne Aug. 6, 1840; was in the U. S. 1836–37, in England 1838–40, and in prison at Ham 1840–46; French Deputy 1848; Pres. of the Republic Dec. 20, 1848–Dec. 2, 1851, when he dissolved the Assembly and proclaimed himself Emperor. Jan. 30, 1853, he married Eugénie de Montijo of Spain. He participated in the Crimean War 1854–56, that in Italy 1859, and promoted Maximilian's Mexican venture 1862. He declared war against Prussia 1870, was overwhelmed and captured at Sedan Sept. 2, 1870, and died at Chiselhurst, England. He pub. *Idées Napoléoniennes*, 1838, and *César*, 1865–66. *Œuvres*, 1854–69. 1873.—His son, EUGÈNE LOUIS JEAN JOSEPH, PRINCE, 1856–1879, was educated at Woolwich, England, and killed in Zululand.

**Napoleon Gun.** French bronze gun, designed 1856; intended to replace the light and heavy field guns of that time, and thus to simplify the field artillery service; adopted into U. S. service 1857, and retained until the introduction of the 3-in. wrought-iron rifled gun. It did good service during the Civil War, its destructive power at the short ranges, within which the heavily wooded and broken character of the country forced battles to be fought, giving it a great advantage. Its caliber was 4.62 in., length 72.15 in., weight 1,200 lbs.

**Naquet,** ALFRED JOSEPH, b. 1834. French chemist, author, journalist, and radical politician.

**Naraka.** Indian hell. Buddhism has at least 34 of them, varied in temperature and accommodations.

**Narbada,** or NERBUDDA. River of central India, flowing w. into Gulf of Cambay. Length 800 m., drainage area 36,400 sq. m.

**Narbonne.** City of s. France, near the Gulf; colonized by Romans 118 B.C.; taken by Visigoths 412, by Saracens 719, by Franks 759; governed by viscounts till 1507, when it was united to the crown of France. Pop., 1891, 27,150.

**Narceine.** $C_{23}H_{29}NO_9+2H_2O$. One of the alkaloids present in opium; long white prisms, soluble in water, mpt. 145.2° C. It is inert on animals.

**Narcissus.** Genus of showy-flowered, bulbous herbs of the natural family *Amaryllidaceæ*, natives of s. Europe, much planted for ornament.

**Narcissus.** In Mythology, handsome youth, for love of whom the nymph Echo died. Enamored of his own image in a fountain, he pined away and turned into a flower.

**Narcomedusæ.** Group of *Hydromedusæ*, of which the *Æginidæ* are typical. See TRACHYMEDUSÆ.

**Narcotics.** Substances having the property of stupefying. They are used in medicine as soothing agents, exerting special influence on the brain and nerves. As a general rule, they stimulate in small doses; in larger quantities they act as sedatives, producing sleep, coma and death. The most important are OPIUM and MORPHINE (q.v.).

**Narcotine.** $C_{22}H_{23}NO_7$. Mpt. 176° C. An alkaloid present in opium; obtained by treating morphine with caustic potash. It crystallizes from alcohol in shining prisms. It is inert.

Narcissus Poeticus.

**Nares.** Openings into the nasal sac. Those opening outward are the external nares (nostrils):

those opening into the mouth or pharynx, the internal or posterior nares.

**Nares,** SIR GEORGE STRONG, F.R.S., b. 1831. Scottish Arctic explorer 1852–54 and 1875; in May, 1876, his men reached 83° 10′ 26″ N. lat. *Seamanship*, 1860–62; *Narrative*, 1878.

**Nares,** ROBERT, F.R.S., 1753–1829. Archdeacon of Stafford and prebendary of Lincoln. He founded the *British Critic* and edited it four years. *Glossary of Words and Phrases*, 1822.

**Nares Perviæ.** Incomplete septum between the nasal cavities of birds.

**Narino,** ANTONIO, 1765–1823. Colombian patriot, prominent in the war of liberation; prisoner in Spain 1795–97 and 1814–20.

**Narragansett Bay.** Deep indentation in R. I. coast; 28 m. long. Named after the extinct Indian tribe, a branch of the Algonquins.

**Narrow Gauge.** Railroad having the two rails less than 4 ft. 8½ in. apart. The most usual are 3 and 3½ ft.; they are mainly used in mountainous countries and for short branch lines. The cost of construction is much less than for the standard gauge, and sharper curves may be used. The advantage of uniformity, however, is so great that these lines are not profitable when they connect with standard gauge roads.

**Narses,** d. ab. 573. Eunuch and slave, made councilor by Justinian; general-in-chief in Italy 552, where he crushed the Goths; exarch of Italy till 565.

**Narthex.** In early Christian Architecture, the arcaded porch in front of the church. It was one of the features of the Roman basilica, from which the earliest Italian churches were adapted or imitated.

**Narva.** Russian town, s. of Gulf of Finland. Here, Nov. 30, 1700, Peter's camp, with 50,000 Russians, was stormed by Charles XII. with 8,000 Swedes. Pop. ab. 8,600.

**Narvaez,** PANFILO DE, ab. 1475–1528. Spanish officer, sent to Mexico against Cortez, who defeated him at Cempoala May 26, 1520; lost on his return from an ill-starred expedition to Florida.

**Narvaez,** RAMON MARIA, DUKE OF VALENCIA, 1800–1868. Spanish soldier, ennobled 1844; repeatedly Prime Minister.

**Narwhal.** See MONODONTIDÆ.

**Nasby,** PETROLEUM V. See LOCKE, DAVID R.

**Nascent State.** Supposed interval, during reactions between chemical compounds, between the moment a given atom is liberated from a compound and that when it unites with some other atom. During that period it displays remarkable activity and reacts with extreme ease with other substances.

**Nascimento,** FRANCISCO MANOEL DO, 1734–1819. Portuguese poet and translator, resident in Paris from 1778.

**Naseby,** BATTLE OF. In Northamptonshire, June 14, 1645; decisive victory of the parliamentary forces under Fairfax and Cromwell over Charles I., who fled, with loss of 5,000 men, artillery, baggage, and papers.

**Nash,** JOHN, 1752–1835. English architect.

**Nash,** RICHARD ("BEAU"), 1674–1761. Master of ceremonies at Bath 1704–54; noted as a gamester and man of fashion.

**Nash,** THOMAS, 1567–1601. English pamphleteer and satirist. He took part in the Marprelate controversy.

**Nashua.** City of Hillsborough co., N.H., on N. River at its junction with the Merrimack. It has 6 railroads and large manufactures of cotton and woolen goods and of iron. Pop., 1890, 19,311.

**Nashville.** Capital of Tennessee, and of Davidson co., on the Cumberland; site of the Univ. of Nashville, Vanderbilt Univ., Fisk Univ. for colored people, and several colleges. Here, in a critical battle Dec. 15 and 16, 1864, Gen. Thomas defeated Hood. Pop., 1890, 76,168.

**Nashville,** UNIVERSITY OF. Founded 1785 as an academy; enlarged 1806 and 1826. Including the Medical school, opened 1850, it has ab. 1,000 students.

**Nasir Khosrau** (ABU MU'IN-ED-DIN NASIR BEN KHOSRAU), 1004–1088. Persian didactic poet, originally a Sunnite. Going to Mecca on a pilgrimage by divine command, as he thought, he was converted to the Shi'a sect. Most of his poetry praises Cairo and its theology.

**Nasmyth,** JAMES, 1808–1890. Scottish inventor and engineer. He introduced the steam hammer, steam pile-driver, and other automatic machines.

**Nasmyth** (or STEAM) **Pile-Driver.** Invented 1850. The hammer is lifted by the pressure of steam. The ram weighs ab. 3,000 lbs., has a fall of 36 in., and makes 60 blows per minute.

**Naso.** See OVID.

**Naso-frontal Process.** Anterior boundary of the mouth, between the nasal openings in young embryos.

**Nason,** PIETER, 1[illegible] Dutch portrait painter. An example is in the [illegible]eum of New York.

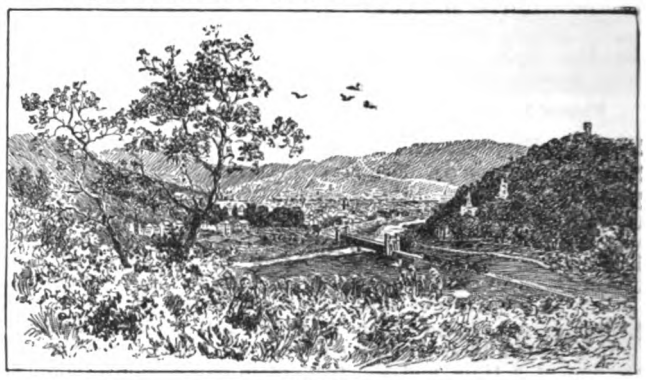
**Nasr-ed-din,** 1831–1896. Shah of Persia from 1848; son of Mehemet Ali. He visited Europe 1873 and 1889.

**Nassa.** See RHÆHIGLOSSA.

**Nassau.** District of Prussia, early occupied by Alemanni, who were subdued by Franks; afterward part of the German empire. From Otto of Laurenburg sprang two lines of princes, who in 1255 divided the land between them. From Walram II. is derived the House of Laurenburg, or N., so called since ab. 1200; from Otto, that of N.-Gelders, still surviving in the female branch, whose representatives since 1544 have been known as Princes of Orange. N. was declared a duchy 1806. In 1866 it took sides with Austria and was incorporated with Prussia.

**Nassau.** Capital of the Bahamas, in New Providence. Pop. ab. 11,000.

**Nassau.** Town of Prussia in the province of Hesse-Nassau, on the right bank of the Lahn, 10 m. s.e. of Coblentz. It is the



Nassau.

birthplace of Baron Stein, of whom there is a statue on the neighboring castle of Stein. Pop. 2,200.

**Nassau,** JOHAN MAURITZ VAN, COUNT, 1604–1679. Dutch soldier; Gov. of Dutch Brazil 1637–44; Gov. of Cleves from 1647.

**Nasse,** ERWIN, 1829–1890. German political economist; prof. Rostock 1856, and Bonn 1860. *Die Preussische Bank*, 1866; *Ueber die mittelälterliche Feldgemeinschaft in England*, 1869.

**Nast,** THOMAS, b. 1840 in Germany. American caricaturist and lecturer, noted chiefly for his cartoons in *Harper's Weekly* 1862–74, especially those attacking the Tweed ring. He removed to England 1894.

**Nasturtium.** *Tropæolum majus.* Herbaceous vine of the Geranium family, bearing showy red or yellow flowers, much cultivated for ornament and the fruit used for pickles.—Also, with some authors, a genus of the Mustard family, including the Water-cress (*Roripa nasturtium*).

**Natal.** British colony on the s.e. coast of Africa; acquired

Map of Natal.

from the Boers 1843; area ab. 20,500 sq. m. The coast is mainly

low, the land rapidly rising by terraces to the w. boundary, which consists of the Drachensberg mountains, 10,000 ft. high and 4,000 ft. above the plateau at their base. The lower country is fertile and covered with tropic vegetation. As the land rises it becomes more arid, the higher plateaus being grass-covered. Agriculture and stock-raising are the principal pursuits. Pop., 1891, 543,913, of whom ab. 9 per cent were Europeans and 83 per cent Kaffirs.

**Natalie.** Ex-Queen of Servia, a Russian; married to King Milan 1875, divorced by him 1888, and reconciled to him 1893.

**Natant.** Aquatic plants which float unattached.

**Natantia.** Free-swimming animals, as distinguished from sessile forms in the same group; *e.g.*, one section of sub-order *Peritricha*, containing several families. See HETEROPODA.

**Natantia** (ASCIDIÆ SALPÆFORMES). See ASCIDIACEA.

**Natatores** (SWIMMING BIRDS). Order of aquatic birds, with short legs, placed far back, and webbed feet. Many are good flyers as well as swimmers, but some have fin-like wings and cannot fly. Most are migratory. Most are good divers. They feed on worms, fishes, or seeds, the form of beak varying, with the mode of subsistence, from flat to pointed. They nest on the ground near the shore. Many are valuable for food, for their skins, or for their excrements (guano). The principal families are *Impennes*, *Alcidæ*, *Lamellirostres*, *Steganopodes*, *Laridæ*, and *Procellariidæ*. Penguins, Auks, Ducks, Pelicans, Gulls, and Petrels are examples of these groups respectively. These all fall into the two divisions, *Schizognathæ* (in part), and *Desmognathæ* (in part).

**Natchesan Indians.** The Natchez and Taensa tribes of N. American Indians.

**Natchez.** Capital of Adams co., Miss., on the Mississippi; settled by French 1716, and English 1763; chartered as a city 1803; important for the shipping of cotton. The N. Indians occupied this region till ab. 1730, and warred with the French. Pop., 1890, 10,014.

**Nathan.** Prophet who rebuked King David (II. Sam. xii.).

**Nathanael.** Galilæan disciple of Christ, mentioned John i.; commonly identified with Bartholomew.

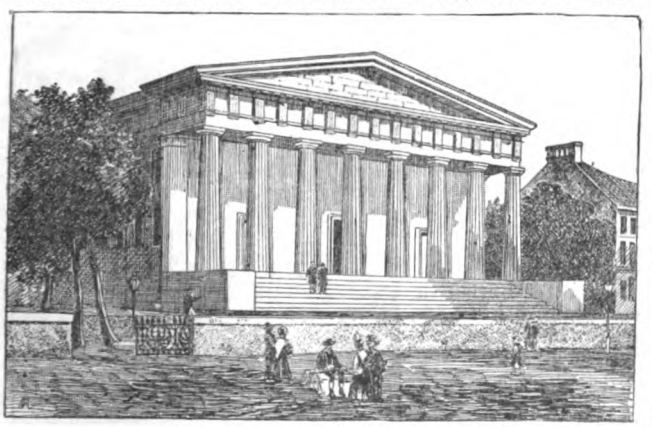
**National Academy of Design.** In New York, founded 1826; elects Academicians and Associates; holds annual art exhibitions and maintains schools of art.

**National Academy of Sciences.** Incorporated by Congress 1863; meets semi-annually for discussion of scientific subjects. It also makes reports upon subjects of science and art for the Government, if requested. The number of members is limited to 100.

**National Armory.** At Springfield, Mass., for fabrication of U. S. rifled magazine gun. Its capacity is ab.120 rifles per day, which can be greatly enlarged, either by an increase of plant or by overtime work. It is commanded by a Colonel of the Ordnance Department.

**National Assembly.** Convened in France June 17, 1789.

**National Banks.** The first bank was opened in Mass. 1686. The colonial banks were followed by the Bank of N. America, established by Congress 1781 and chartered by several of the State legislatures. The first U. S. Bank was established by Congress 1791 with a charter to run for 20 years. Through the opposition of the numerous State banks, it failed of getting an extension of its charter and dissolved 1811; but in 1816 Con-



U. S. National Bank, Philadelphia.

gress chartered the second U. S. Bank at Phila., with power to establish branches. This compelled the State Banks to resume specie payments, and business improved. In 1829 Pres. Jackson, who was opposed to the U. S. Bank, vetoed the bill to renew its charter. Its dissolution caused the State institutions to spring up rapidly; there were 634 in 1837, when, upon the people demanding specie in exchange for their notes, the great crash came. Another followed 1857, though of a less serious nature. The present National Bank system grew out of the necessities of the Civil War. The banking law now in force was passed June 3, 1864. The essential feature of this system is the authorized issue of bank-notes based upon U. S. bonds deposited with the Treasurer in Washington. The amount of these notes is limited to 90 per cent of the current value of the bonds; the payment of the notes is guaranteed by the Government, which has a lien upon the assets of the bank, if for any reason the bonds should fail to cover the outstanding notes. The banks pay revenue to the Government on the circulation allowed by law, on the deposits in the bank, and on capital not invested in Government bonds. The capital of the 3,689 National banks, July 14, 1896, was $651,144,855; surplus $284,368,424; individual deposits $1,668,413,508; U. S. deposits $12,556,150; national bank notes in circulation Oct. 1, 1896, $220,804,863; amount of last in U. S. treasury $12,834,494. See BANK.

**National Cemeteries.** Burial places provided for soldiers by the U. S. and located in different States, principally in the South, near the great battlefields of the Rebellion. There are 83 in all, one being outside the U. S. in the city of Mexico. They are divided into four classes, according to their size and the pay of their superintendents: they are in charge of the Quartermaster-general's Department, U. S. Army.

**National Convention.** In France, 1792–95.

**National Covenant.** Called Scots Confession and Short Confession to distinguish it from the Confession of Faith. It was drawn up by John Craig at the command of James VI. in 1580, to counteract the attempts made by the Roman Catholics to regain their hold on Scotland.

**National Debt.** Sum of indebtedness of any national government, whether represented by bonds, inscriptions on an interest account, an inconvertible paper currency, or current indebtedness.

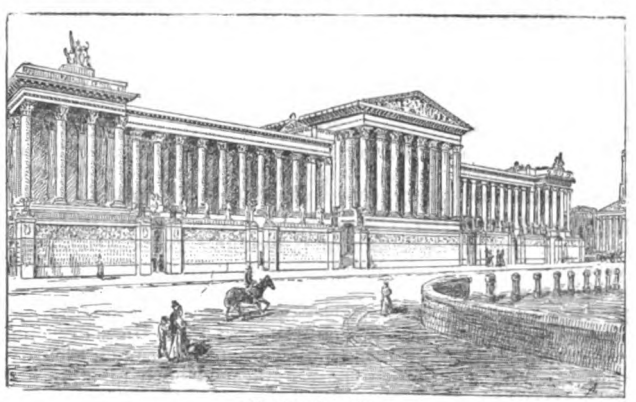
**National Debts.** See the Appendix.

**National Dividend.** Net annual aggregate of commodities, material and immaterial, produced in any country by the labor and capital of the country acting on its natural resources.

**National Economy.** Political economy, looked upon as derived from the conditions, and suited to the practical needs and destinies, of a particular country and nation, instead of being a set of abstract and cosmopolitan laws and precepts.

**National Flag.** The U. S. flag has 13 horizontal stripes, seven red and six white, the red and white stripes alternating, and the union of the flag consists of white five-pointed stars in a blue field placed in the upper quarter next the staff, and extending to the lower edge of the fourth red stripe from the top. The number of stars is that of the States in the Union: it is now 45, arranged in six rows, the first, third and fifth having eight stars, and the second, fourth and sixth, seven stars each. On the admission of a State into the Union, one star will be added to the union of the flag, and such addition will take effect on the 4th day of July next succeeding such admission. See FLAG, AMERICAN.

**National Gallery.** In London; leading English picture gallery. Its building, on Trafalgar Square, dates from 1838, but has been much enlarged since. It contains over 1,300 pict-



National Gallery.

ures and is especially strong in the Italian and English Schools. The average quality of the foreign old masters is very high and the preservation excellent.

**National Guard.** The militia organizations of some of the States (*e.g.* N.Y.) are authorized by State laws to be so called. After the destruction of the Bastile a garde nationale was formed in Paris from the bourgeois in 1789 under Lafayette as Colonel-General, but was disbanded by Napoleon, who reorganized it 1814. It was adopted as an institution under the Restoration, was considerably modified by the decree of 1852, and fought in the Franco-Prussian war of 1870.

**National Homes for Disabled Volunteers.** The act of Congress March 3, 1865, incorporated the National Asylum and provides by annual appropriation for its support. It now consists of the Central Branch at Dayton, O., the N.W. Branch at Milwaukee, Wis., the E. Branch at Togus, Me., the S. at Hampton, Va., the W. at Leavenworth, Kan., the Pacific at Santa Monica, Cal., and the Marion at Marion, Ind. The largest, that at Dayton, contains about 5,000 inmates. Total number of inmates 1896 was 26,512; average number 17,451. See STATE HOMES FOR DISABLED VOLUNTEERS.

**National Hymns.** The English anthem, *God Save the King*, was first printed 1742; its origin is unknown, but is attributed, music and words, to Henry Carey, ab.1740. An adaptation from the words in German by B. G. Schumacher in 1793 is used as the Prussian hymn, beginning *Heil dir im Siegerkranz.* The Austrian hymn was composed by Haydn 1797, words by Baron Zedlitz, beginning *Gott erhalte Franz den Kaiser.* The French hymn, *Marseillaise*, was written and composed 1792 by Claude J. R. de Lisle, 1780–1856. The Portuguese hymn was composed by Dom Pedro I. of Brazil. The Russian hymn was written in 1830 by Gen. Alexis Lwoff, 1799–1870. The Swedish hymn, *King Karl, the Young Hero*, was the work of Esaias Tegner, 1782–1846, and the Norwegian *Sönner af Norge* was by C. Blom, ab.1800. The Dutch hymn, *Wien Neerlandsch Bloed*, the words were by Henrik Tollens, 1780–1856, and music by J. W. Wilms. The Danish hymn, *Kong Christian*, the words were by Ewald and the music by Johann E. Hartmann, 1726–1791. The Hungarian hymn, *Szozat, the Appeal*, words were by Vörösmarty, 1800–1855, music by Egressy, and the *Magyar Hymnusz*, words by Kölesey and music by Francis Erkel. The Belgian song of 1830, *La Brabanconne*, was written by Jenneval, music by Campenhout. The American national songs, *Yankee Doodle*, was probably written by Dr. Schnekburgh, an English army surgeon, ab.1755, the tune of English origin, and the *Star Spangled Banner* was written by Francis Scott Key.

**Nationalism.** Form of socialism which proposes that several classes of industries should be monopolized and administered by the national government. Its origin is closely connected with the publication of Bellamy's romance, *Looking Backward*, 1889.

**Nationalization of Land.** Substitution of national for individual ownership of land, either actually by administering its occupancy, or inferentially by absorbing its full rental value through a tax.

**National Museum.** At Washington; founded 1846; branch of the Smithsonian Institution. Its American antiquities are naturally its most extensive and valuable possessions, but it has many miscellaneous collections of value, including those illustrating the animal and mineral resources of U. S. Bulletins and Proceedings are issued from it.

**National Music,** or FOLK MUSIC. That, both vocal and instrumental, which, by peculiarities of rhythmical and melodic structure, reflects the mental and emotional characteristics of the people or tribe that originate it. It is spontaneous rather than reflective in its origin, and the adoption of its characteristics by composers leads to National Schools of Music.

**National Park.** In Canada, an area 26 m. by 10 m. in extent, at Banff in Alberta. See YELLOWSTONE and YOSEMITE.

**National School of Political Economy.** Group of American Economists, laying stress on the peculiar economic conditions of the U. S., and supporting certain corresponding forms of economic policy, especially that of Protection.

**National Wealth.** Total wealth of a nation, including all commodities in possession of individuals, corporations, and government, but not including bonds, mortgages, and other evidences of debt.

**Nations** (OF THE UNIVERSITIES). Classes of students, organized according to race or country. At Paris these divisions existed from ab.1220: in 1249 there were four, France, Picardy, Normandy, and England. These embraced both masters and students until ab. 1275, after which the three superior Faculties were entirely separate from the "Nations." At Padua 22 "Nations" were represented; at Bologna, the Transalpine University consisted of 18, the Cisalpine of 17. There was a like division at other educational centers.

**Native Bear** (OF AUSTRALIA). See CARPOPHAGA.

**Nativism,** or INTUITIONALISM. Belief in innate ideas, or knowledge not derived from experience.

**Natoire,** CHARLES JOSEPH, 1700–1777. Historical painter of the French school. He was a pupil of Galloche and Lemoyne;

Autumn, by Natoire.

became Member of the Academy 1734, Prof. 1737, Director 1751–74.

**Natolia.** See ANATOLIA.

**Natrolite.** $Na_2Al_2Si_3O_{10}+2H_2O$. Hydrous sodium aluminium silicate, frequently occurring as a fibrous zeolite in cavities in trap rocks.

**Natron.** $Na_2CO_3+10H_2O$. Hydrous sodium carbonate, containing 62.9 per cent of water; found in the waters of some mineral springs or saline lakes, especially in Egypt, or associated with other sodium salts in alkaline deposits like those of Wyoming and the Great Basin between the Wasatch and the Sierra Nevada mountains.

**Natron Lakes.** In a valley of the Libyan desert, called the Natron Valley, ab. 60 m. n.w. of Cairo, and consist of 8 pools below the sea level, rich in sodium carbonate. The place is noted for its four monasteries which contain valuable Coptic, Arabic and Syriac MSS.

**Nattier,** JEAN MARC, 1685–1766. French portrait and historical painter.

**Natural Agents,** IN ECONOMICS. Primary agents in the production of wealth; usually classified as land, labor, and capital.

**Natural Bridge.** In Rockbridge co., Va.; ab. 235 ft. high and 50 ft. wide. From colonial times it has attracted many visitors.

Natural Bridge in Virginia.

**Natural Cement.** See CEMENT, CEMENT TESTS, and HYDRAULIC LIMESTONE.

**Natural Gas.** 1. Marsh gas, or light carbureted hydrogen, $CH_4$, about half as heavy as atmospheric air, a product of the decomposition of vegetable matter buried in wet, swampy places, and of very common occurrence over the earth's surface.

2. Mixtures of marsh gas and other gaseous substances accumulated in deep-seated geological formations, and usually reached by boring wells through the overlying rocks. In this form it has been known to exist since very early times, but it was not

found in quantity sufficient to make it commercially available for lighting and for fuel as a substitute for coal till ab. 1880. The principal gas-producing regions in the U. S. are in Pa., Ohio, and Ind. The gas is not limited to any one geological horizon, though the palæozoic rocks are the chief sources of supply in those States. The principal geological conditions essential for the accumulation of natural gas are: (1) the presence of organic matter by whose decomposition the gas is formed; (2) a porous or open-textured rock to serve as a reservoir; (3) a protecting cover of impermeable rock to prevent premature escape of the gas into the air. The value of the natural gas produced in the U. S. increased very rapidly from 1880–88, amounting in 1888 to over $22,000,000; but it has materially declined in the past few years: in 1895 its value was $12,000,000.

This valuable product was long regarded as a nuisance; but since 1885, when very large supplies were obtained near Pittsburgh, it has been utilized on a vast scale, both for household and manufacturing purposes, either from wells sunk in the vicinity or through pipes from places that are oversupplied. How long this yield of gaseous fuel will continue is a matter of speculation, but doubtless it will be exhausted in time. Many other places in the U.S. have also met with considerable quantities of gas in the strata below them, but none have come up to the immense supply afforded by the great "gushers" of Pa., Ohio, and Ind. The plain of Baku, on the Caspian Sea, is also giving very large supplies of natural gas in connection with its petroleum. See PETROLEUM.

**Natural History.** Originally synonymous with what we now call Natural Science (sciences that treat of natural things), the word finally came to mean the science which treats of living things, and the history of the earth as seen in the strata of fossil-bearing rocks. The term is now more or less obsolete, being largely replaced by Biology (with a more definite meaning); but it is often used as synonymous with zoölogy. A naturalist is generally a zoölogist.

**Naturalists.** In Art, opposed to the Eclectics of Bologna. Beside this school, it holds first rank in Italian 17th century art. See CARAVAGGIO, RIBERA, SALVATOR ROSA, and BOLOGNA, SCHOOL OF.

**Naturalized.** Plants which have been introduced into one country from another and become permanently established.

**Naturalization.** Acquisition of citizenship by an alien. The U. S. Congress has exclusive power to confer national citizenship, although each State may confer upon aliens the privileges and immunities of State citizenship. To become a citizen of U. S. an alien must have lived in the country five years and have declared his intentions two years prior to receiving his final papers. The right to vote is given by the several States, and if he declares his intention to become a U. S. citizen, he may in some States receive it in six months after landing.

**Natural Law.** Body of tacitly accepted and understood rules or customs, which have grown up of themselves, and are not reduced to the form of positive law.

**Natural Philosophy.** See PHYSICS.

**Natural Religion.** That knowledge of God and reverence for Him, accompanied by a knowledge and practice of duties toward our fellow men, which is based on and derived from nature, apart from revelation.

**Natural Rights.** Such fundamental rights of human beings as are dictated by natural justice, and should be recognized and established by every body of positive laws.

**Natural Selection.** Survival of the fittest. Just as breeders select those variations that show the desired character most strongly and so produce new races of animals, so does Nature give the advantage in the struggle for existence to the best adapted forms. A slow change in environment is accompanied by progressive changes in the species in a given region; and a differentiation of environmental characters in different localities results in corresponding differentiation of the organisms common to the regions into distinct species. See DARWINISM.

**Natural System.** Classification of animals or plants according to genetic affinities. It implies descent of different species from a common ancestry.

**Natural Theology.** Study of the being and attributes of God as supposed to be traceable in nature. It results merely in theism, and can do no more than pave the way for revealed religion. Its province being thus limited, less stress is laid upon it than formerly, when (as with Paley) it was thought equally important with Christian Evidences.

**Natural Wants.** Desires or needs arising from man's nature, without the satisfaction of which he cannot exist, or exist in a normal condition. Such wants are those for food and drink, for shelter, for rest and sleep.

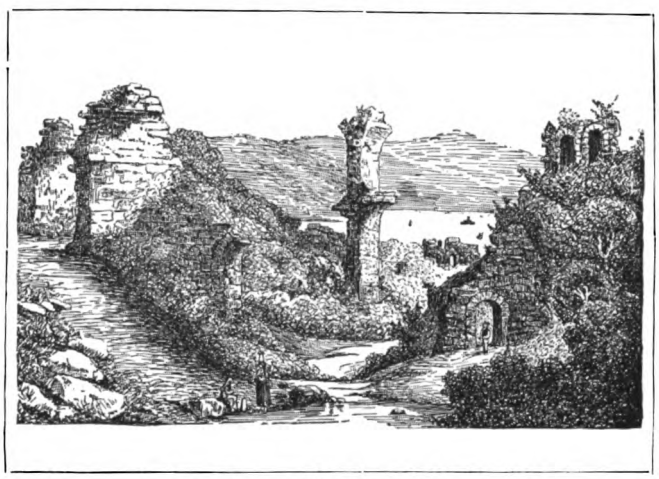
**Nature.** Name which has always stood for a fixed as opposed to a capricious order of events, but has varied with different periods in its specific conception: (*a*) originally a term for the process of becoming or development; (*b*) then for the material world as opposed to the spiritual; and (*c*) for any fixed order of events, whether mental or physical, which is opposed to the supernatural, occasional, or arbitrary. When thus sifted down, it denotes the laws of things, though often wrongly conceived as a cause.

**Nature Printing.** This process is applicable only to flat objects, such as botanical specimens, the parts of the plant being given with an accuracy and minuteness which the finest work of the engraver cannot attain. The specimen is laid upon an even surface of pure lead, and passed through rollers under great pressure, which leaves the imprint of the specimen upon the lead. If only a few impressions are to be made the lead plate is used for printing, otherwise an electrotype is made from it.

**Nauck,** AUGUST, 1822–1892. German editor of Greek classics and Neoplatonists; at St. Petersburg from 1856.

**Naukratis.** Greek settlement of the Nile Delta, flourishing ab. 660–500 B.C.; excavated by Petrie 1884–85, with important results as to demonstration of Egyptian influence on Greek art. Some of the pottery fragments and other objects found there are in the Boston Museum.

**Naumachia.** In Roman antiquities, mimic sea-battles fought by gladiators, generally upon an artificial lake constructed for the purpose. Claudius gave such an exhibition upon the Fucine lake, wherein 100 war-ships and 19,000 men took part.



Naumachia at Cyzicus.

**Naumann,** KARL FRIEDRICH, 1797–1873. Prof. of Crystallography 1826 and Geognosy 1835 at Freiberg and at Leipzig 1842. *Elemente der Mineralogie*, 1846–85; *Lehrbuch der Geognosie*, 1849–54; *Lehrbuch der Krystallographie*, 1829; *Elemente der theoretischen Kyrstallographie*, 1856.

**Naumburg.** Town of Prussian Saxony, on the Saale; said to have been delivered from siege by Hussites under Procopius 1432. Here the Protestant princes met Jan. 20–Feb. 8, 1561, refused to take part in the Council of Trent, and demanded a German council. Pop. ab. 20,000.

**Naumkeag,** or NAUMEAG. Indian name of Salem, Mass.

**Nauplia.** Ancient Greek town on Gulf of Argos; capital of Greece 1825–34. Pop., 1889, 5,459.

**Nauplius.** Young of Copepods, and earliest larval form of higher crustacea. It has three pairs of appendages (two pairs of antennæ and the mandibles), which are mainly locomotor in this stage.

**Nausea.** Sickness at the stomach with inclination to vomit, generally accompanied by a sense of disgust or loathing, and sometimes by a feeling of great depression.

**Nausicaa.** Daughter of Alcinous, king of the Phæacians. She conducted the shipwrecked Ulysses to her father's court.

**Nautch Girls.** Female dancers in India and the E. Indies, sometimes wandering, sometimes attached to temples. Modern

Nautch Girl Dancing.

representatives of the Phœnician Kedeshoth, who prostituted themselves in the service of the god.

**Nautical Almanac.** Publication which gives at short intervals of time the positions of the sun, moon, planets, and principal stars, with much other matter of great importance to astronomers and navigators. Works of this kind are issued by several leading European and American states. The most important are the *British Nautical Almanac*, *American Ephemeris and Nautical Almanac*, *Connaissance des Temps*, pub. by France, and the Berliner *Jahrbuch*. These works are generally published three years in advance. See EPHEMERIS.

**Nautical Mile.** See KNOT.

**Nautical Schools.** For training boys for merchant marine service. There are several such schools in Great Britain for sailors and officers. In 1874 U. S. Congress authorized the loaning of vessels to States and the detail of officers of the navy as instructors, and schools were established at New York, San Francisco, Philadelphia and Boston; that at San Francisco has been abandoned.

**Nautilus.** See TETRABRANCHIATA.

**Nauvoo.** Village of Hancock co., Ill., on the Mississippi; founded 1840 by ab. 15,000 Mormons, who had been expelled from Mo. Their temple, built at a cost of over $1,000,000, was consecrated May 1, 1846. Sept. 10–13, 1846, the town was attacked by a lawless force of 1,000 men with artillery. The Mormons evacuated it Sept. 17, and took their way westward.

**Navajo Indians.** See APACHES.

**Naval Academy.** School in which men are educated for the naval service. The U. S. Naval Academy is at Annapolis, Md., and was founded by George Bancroft, Sec. of Navy, 1845. It was opened Oct. 10, 1845. In 1861 the Academy was removed to Newport, R. I., and in 1865 re-established at Annapolis. The course is for six years, the last two at sea; in the fourth year there are two courses, one for service in the line and the other for naval engineers. The pay is $500 per year. In Gt. Britain the course of instruction consists of 2 years on the training ship, 4½ years at sea as midshipman, 9 months at the Naval College at Greenwich, 3 months at the torpedo school, 9 months at the gunnery school, and 3 months in pilotage. Upon the completion of the course the lieutenant's commission is given. The French school is at Brest.

**Naval Architecture.** See SHIP BUILDING.

**Naval Reserves,** ROYAL. British naval militia, trained for 28 days every year for five years in ships or on shore, and is liable to be called out for five years' service in an emergency. In 1890 there were 558 officers and 19,851 men.

**Naval Signals.** These are made by following a code, as contained in two volumes, the *General Signal Book* and the *Fleet Drill Book*. Each contains words and sentences; opposite to each is a number. This number is shown to the ship, to which it is desired to speak, by a series of flags. At night red or green rockets are used, according to the system of E. W. Very, U.S.N. For distant signaling electric lights are used; ships 60 m. away have been signaled in this way. In fogs the steam whistle or gun is used. There is an international code which allows a ship of any nation to make itself understood by that of any other nation. See SIGNAL CODE.

**Naval Tactics.** See TACTICS, NAVAL.

**Navarete,** BATTLE OF. See NAJARA.

**Navarino,** BATTLE OF. On a bay of s.w. Greece, Oct. 20, 1827. The English, French, and Russian fleets under Sir E. Codrington nearly destroyed the Turkish and Egyptian fleet.

**Navarre.** Old province of Spain, extending n. across the Pyrenees and s. to the Ebro; conquered by Charlemagne 778; an independent kingdom 850. Under Sancho III., 1000, it included much of Aragon. It was united to France 1284, and independent under Joanna II., 1329. Ferdinand of Spain annexed all s. of the Pyrenees 1512. The French division descended to Henry of Navarre, who succeeded to the French crown 1589, and annexed Navarre 1607.

**Navarrete,** FRANCISCO MANUEL DE, 1768–1809. Mexican poet.

**Navarrete,** MARTIN FERNANDEZ DE, 1765–1844. Spanish naval historian.

**Navas de Tolosa.** See TOLOSA.

**Nave.** In Ecclesiastical Architecture, the central or main compartment of a church, between the supports of the principal roof. These supports, a series of piers or columns connected by arches in a building of masonry, or of posts in timber construction, separate the nave from the aisles, which are separately roofed, the space above the roof of the aisles in the

Nave of St. Albans Abbey, England.

walls of the nave becoming the clerestory, or light story, being pierced with windows in addition to those in the wall of the aisle. Where the main body of the church is crossed by transepts, the continuation of it beyond the transepts, though still properly the nave, is known as the choir, the word nave being confined to the body of the church in front of the transepts.

**Navesink Highlands.** In Monmouth co., N. J., on Sandy Hook Bay; marked by twin lighthouses.

**Navicular.** In Botany, boat-shaped organs or organisms. —In Anatomy, the central bone of the tarsus.

**Navicular Disease.** This in the horse is a sprain of the strong flexor tendon of the foot, where it passes over the navicular bone, in the hollow of the fetlock. It is caused by subjecting light young animals to severe work on hard roads. It is recognized by tripping, heat, tenderness, and swelling of the part, and in more advanced cases wasting of the muscles of the leg and undue wear of the toe of the shoe. Treatment consists of rest, hot applications, bandaging, and a soft bed; after the inflammation has subsided the animal should be placed on soft land.

**Navigable Waters.** 1. In England, those subject to the ebb and flow of the tide. 2. In the U. S., generally, those in fact navigable for commerce.

**Navigation.** As distinguished from seamanship, science and art of conducting a vessel from one port to another, in-

cluding determination of the latitude, longitude, and course of the vessel. Previous to 1400 the science hardly existed; although the properties of the magnetic needle were known much earlier, the general introduction of the Mariner's Compass was a slow process, the early instruments being rude affairs, frequently of little use. The early navigators were therefore obliged to limit their operations mainly to coasting along the shore, or if they ventured out to sea it was at great peril. During the 15th century a number of important exploring expeditions were sent out by the Portuguese: Prince Henry, and after him John II., took active measures to collect and improve the available knowledge on this subject. An observatory was established at Sagres, in order to obtain better tables of the sun, and a government committee of navigation was instituted. This may be regarded as the origin of the science of navigation in Europe. The appliances of the navigator at that time were a cross-staff or astrolabe (rude instruments for measuring the sun's altitude), a compass, tables of the sun's declination, tables for correcting the altitude of the pole star, and sometimes a rough chart. Even the log for measuring the vessel's velocity was not invented until 1607. Since then almost every science and art has contributed to the comfort, safety, and convenience of the mariner, and the perils of navigation have almost disappeared.

**Navigation Laws.** By common consent, the open sea, which term includes all the great seas and oceans beyond three miles from land, is free to the ships of all nations. The rules regulating this freedom belong to International Law. Within the three-mile limit each nation has jurisdiction as over its own territory, passing laws to govern the use of such waters, both by its own subjects and foreigners. From 1651 to 1849 the laws of England restricted the trade between that country and her colonies to vessels built, owned, and manned by England or the colonies, and limited foreign importations to England to ships of the country producing the article.

**Navigators' Islands.** See SAMOA.

**Navy.** The organized public vessels of a country; the system for the defense of the nation by sea. See NAVIES OF THE WORLD in the Appendix.

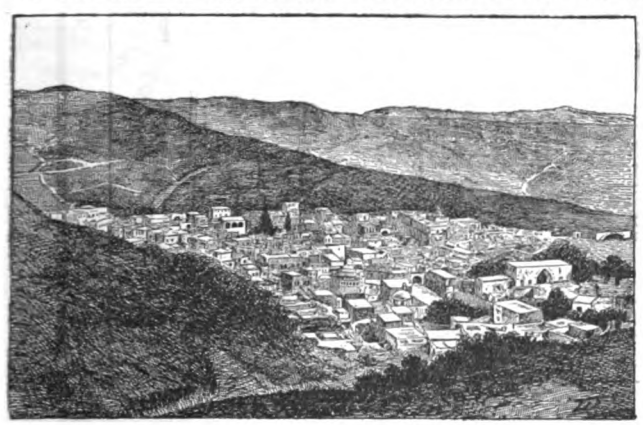
**Navy Department** OF U. S. Presided over by the Sec. of the Navy, who is the adviser of the President on all affairs pertaining to the Navy. The Sec. of the Navy is assisted by an Assistant Sec. and the chiefs of eight bureaus, as follows: navigation, supplies and accounts, medicine and surgery, steam-engineering, repairs and construction, yards and docks, equipment, and ordnance; the bureaus are in charge of naval officers for four years, with the rank of commodore for this term. In England the navy department is designated the Board of Admiralty.

**Navy Yards** OF U. S. These are at Boston, Brooklyn, Philadelphia, Portsmouth, Norfolk, Pensacola, San Francisco, and Washington.

**Naxos.** Largest of the Cyclades, midway between s. Greece and Asia Minor; 20 m. by 14; despoiled by Persians 490 B.C.; held by Athens 466 B.C., by Venice 1206, by Turks 1566–1828. Pop. ab. 15,000.

**Nazarenes.** Jewish Christians who denied the necessity of the Mosaic Law for Gentile believers, though observing it themselves; opposed to the Ebionites, who made Christianity a mere feeder of Pharisaism.

**Nazareth.** Village of Galilee, residence of Jesus, 17 m. s.e.



Nazareth.

of Acre near the plain of Esdraelon. It has a church, reputed to be built on the site rendered memorable as the scene of the annunciation of the advent of Christ. It fell into the hands of Saladin 1187, and was ruined 1263 by the Sultan of Egypt. Pop. ab. 7,500.

**Nazarites.** Israelites vowed, for life or a time, not to cut their hair nor to drink wine (Numbers vi.).

**Neagle,** JOHN, 1796–1865. American portrait-painter.

**Neal,** DANIEL, 1678–1743. London pastor, author of a *History of the Puritans*, 4 vols., 1732–38.

**Neal,** JOHN, 1793–1876. American author, of repute and influence as a pioneer, especially in England, where he lived 1823–27.

**Neal,** JOSEPH CLAY, 1807–1847. American humorist. *Charcoal Sketches*, 1837.

**Neale,** JOHN MASON, D.D., 1818–1866. English hymnist. *Hist. Holy Eastern Ch.*, 4 vols., 1847–51; *Commentary on the Psalms*, 1860–68; *Essays on Liturgiology*, 1863. His long array of tales from Ch. history for children has peculiar charm; his *Rhythm of Bernard*, 1858, and *Hymns of the Eastern Ch.*, 1863, contain the finest lyric versions ever made, and include several of worldwide popularity.

**Neander,** JOACHIM, 1650–1680. German hymnist.

**Neander,** JOHANN AUGUST WILHELM, 1789–1850. German Ch. historian, prof. Berlin from 1813. *Hist. Christian Religion and Ch.*, 6 v., 1826–52; *Planting and Training of the Ch.*, 1832; *Memorials of Christian Life*, 1822; *Life of Christ*, 1837. These and others of his works are familiar in English versions. He was born a Jew, by name David Mendel, and was converted 1806.

**Neap Tides.** Tides which occur when the sun and moon are in quadrature. As in this case the sun tends to produce low water when the moon tends to produce high water, they will be the minimum tides.

**Nearchus.** Officer of Alexander, who sailed a fleet from the mouth of the Indus to the Persian Gulf 325–324 B.C., and wrote an account of his voyage.

**Nearctic Province.** Zoölogical region, including N. America down to Mexico. Its characteristic animals are the American buffalo, turkey, musk-rat, tree-porcupine, and prong-buck. It resembles the Palæarctic Region of the Old World in possessing bears, sheep, reindeer, and beaver.

**Neat's-foot Oil.** Oil obtained by boiling the feet of neat cattle, principally calves' and sheep's feet. It is used for softening leather and is often adulterated with lard oil.

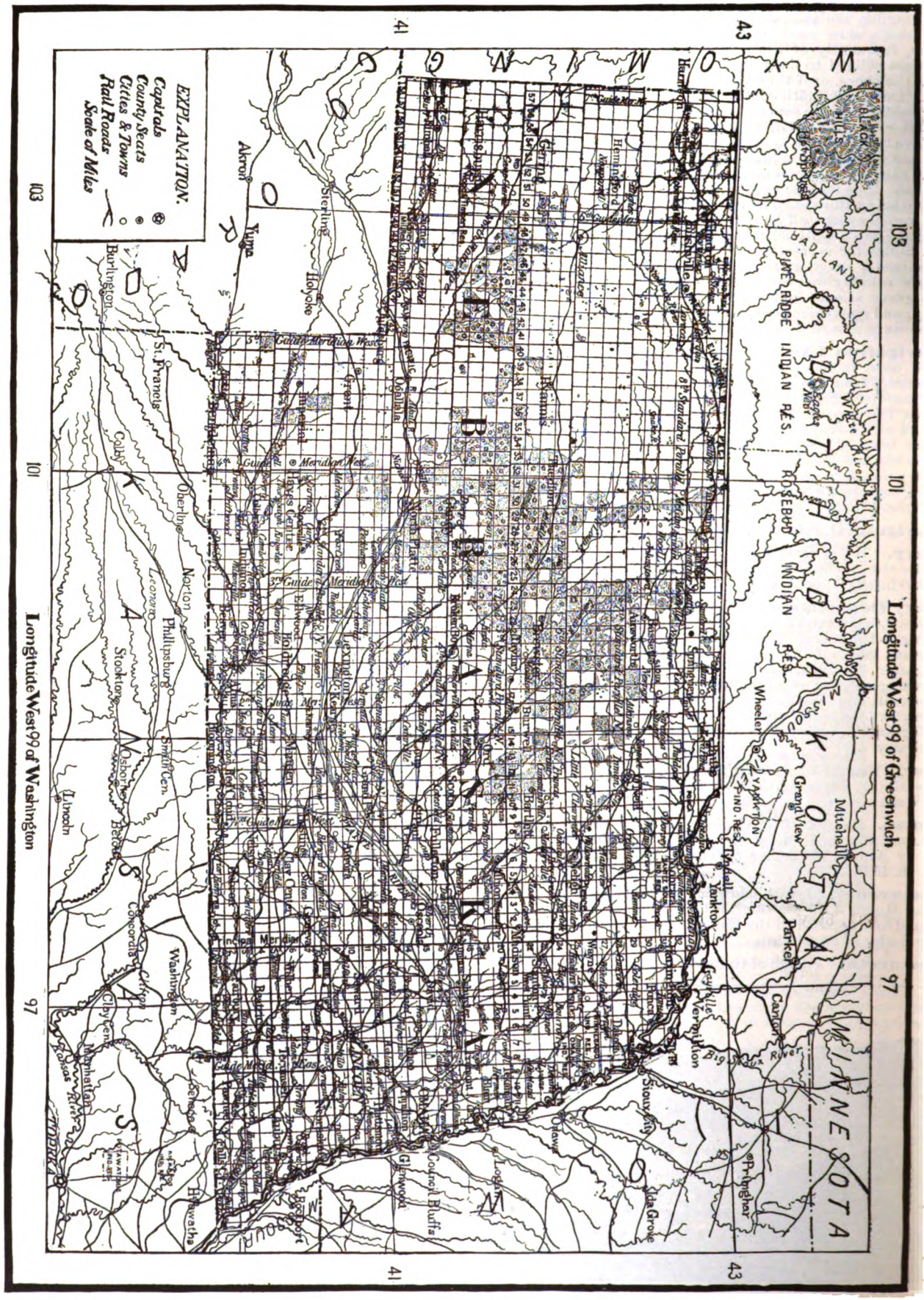
**Nebalia.** Genus of small *Crustacea*, characterized by possessing a cephalothorax like the *Malacostraca*, but bearing Phyllopod-like feet. The abdomen has eight segments, the last two having no appendages, and ends with a fork, as in many *Entomostraca*, and not with a telson.

**Nebo.** Mountain n.e. of Dead Sea, where Moses saw the promised land and died; now Jebel Nibbah; ht. 2,685 ft.

**Nebo,** MT. Highest summit of the Wasatch range, Utah. Altitude 11,992 ft.

**Nebraska.** One of the northern central States. Its area is 76,840 sq. m. Its surface is that of an undulating prairie, merging toward the w. part into semi-arid plains. It has no navigable rivers except the Missouri, which flows on its e. boundary; the Platte and its branches are of interest only for irrigation purposes. The w. three-fourths of the State are overlaid by Neocene formations. E. of this lie Cretaceous beds, and in the s.e. corner is a small area of Carboniferous formations. It is an agricultural State; the principal crop is wheat. Manufactures have not as yet attained any degree of importance, and are confined to a few of the large cities. Coal is mined, but to a very limited extent. The railroad mileage in 1894 was 5,529. The capital is Lincoln, in the e. central part of the State. Omaha, on the Missouri, at the e. boundary, is the largest city. The region was a portion of the original Louisiana purchase, and at first included much more than its present area; it was then occupied mainly by Indian tribes. The first white settlement was made 1847, when a trading post of the American Fur Co. was established near Omaha. N. was constituted a Territory and opened to settlement 1854. In 1861 the Territories of Dakota and Colorado were cut off from it, and in 1863 Idaho. In 1867 it was admitted as a State. Pop., 1890, 1,058,910, ab. 14 per sq. m.

**Nebraska,** UNIVERSITY OF. At Lincoln, Neb.; founded 1869, opened 1871. It comprises colleges of art, science, engineering, law, agriculture, and mechanic arts, with graduate courses. There are 34 professors, 33 instructors, and 60 assistants; students in arts, 497; in industrial branches, 228; in law, 81; in graduate school, 69; in all courses, 1,506. Library, 32,000


EXPLANATION.
Capitals
County Seats
Cities & Towns
Rail Roads
Scale of Miles
Longitude West 99 of Greenwich
Longitude West 99 of Washington
103
101
97
43
41
BLACK HILLS
BADLANDS
PINE RIDGE INDIAN RES.
ROSEBUD INDIAN RES.
YANKTON IND. RES.
MINNESOTA
Mitchell
Grand View
Parker
Canton
Pringhar
Yankton
Wheeler
Vermillion
Sioux City
Ida Grove
Council Bluffs
Glenwood
Logan
Harrison
Sterling
Holyoke
Akron
Yuma
St. Francis
Burlington
Colby
Oberlin
Norton
Phillipsburg
Smith Cen.
Stockton
Osborne
Beloit
Concordia
Clyde
Manhattan
Washington
Hiawatha
Lincoln
Leonora
Guide Merid. West
Guide Merid. East
Meridian West
Meridian East

vols. Annual revenue $130,000, derived in part from State tax, in part from lands.

**Nebraska City.** Capital of Otoe co., Neb., on the Mississippi. It is in the center of a corn belt, and has extensive stock yards, pork-packing plants, and flour and starch mills. Pop., 1890, 11,494.

Nebula of Andromeda.

**Nebuchadnezzar.** King of Babylonia 604–ab.560 B.C.; son of Nabopolassar. He carried many Jews into captivity 605 B.C., completed the conquest of Judea 586, destroyed Tyre after 13 years' siege 585, and rebuilt many cities.

**Nebula.** Luminous, cloudy object, which may be an aggregation of stars so remote that they are not separately visible, or a mass of gaseous matter, not yet condensed into solid bodies, or a cloud of minute solid bodies like meteors. Among the most conspicuous are the following:

| | Right Ascension. | Declination. |
|---|---|---|
| Great nebula of Andromeda . . | 0h. 36m. | 40° 37′ N. |
| Great nebula of Orion . . . . . | 5h. 29m. | 5° 29′ S. |
| Annular nebula of Lyra . . . . | 18h. 49m. | 32° 53′ N. |

**Nebular Hypothesis.** The origin of this is generally referred to Laplace. It supposes the matter of the solar system to have been at one time a gaseous mass extending beyond the orbit of Neptune; by the action of known physical laws it became condensed and formed into the sun and planets as we now see them.

**Necessaria.** Order of the Linnæan class *Syngenesia* (natural order *Compositæ*), having the disk florets staminate, and the ray florets pistillate, as in *Calendula*.

**Necessaries,** IN ECONOMICS. Things needed to enable the average laborer to support himself and his family, and to keep himself in a state of full efficiency; differing, therefore, according to climate, to occupation, and to social position.

**Necessaries,** IN LAW. 1. For married women and minors, food, clothing, etc., suitable to the condition of life of each and not supplied from another source. A wife may pledge her husband's credit therefor, and a minor's estate is liable for his necessaries. 2. For a vessel, things needed for her reasonable outfit.

**Necessity.** Philosophic tenet which in effect excludes freedom of the will.

**Neches.** River heading in e. Texas and flowing generally s.e. to its mouth in Sabine Lake. Length ab. 350 m.

**Necho,** PHARAOH. King of Egypt 609–595 B.C. He slew King Josiah of Judah, at Megiddo, and overran Syria, but was defeated by Nebuchadnezzar at Carchemish and compelled to withdraw into Egypt.

**Neckar.** River of Würtemberg, rising in the Black Forest, flowing n. and n.w., and joining the Rhine at Mannheim. Length ab. 220 m., drainage area 5,000 sq. m.

**Necker,** JACQUES, 1732–1804. French banker, b. in Geneva; father of Mme. de Stael; Director-gen. of Finances 1777–81; Comptroller-gen. 1788–90. *Œuvres Complètes*, 17 vols., 1822.

**Necker,** NOEL JOSEPH DE, 1729–1793. French botanist. *Deliciæ gallo-belgicæ sylvestres*, 1768; *Physiologia muscorum*, 1774; *Elementa botanica*, 1790.

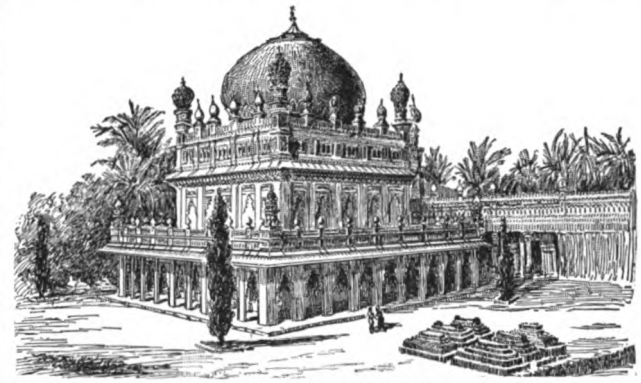
**Necking.** The molding or other ornament upon the shaft of a column, just below the capital.

**Necklace.** See DIAMOND NECKLACE.

**Neckweed.** *Veronica peregrina.* N. American herb, widely distributed in waste and cultivated grounds, of the natural family *Scrophulariaceæ*, appearing like an introduced weed; known as Purslane Speedwell; also Hemp.

**Necromancy.** Divination through spirits of the dead; much practiced in antiquity (as I. Sam. xxviii.), especially by the Greeks. Our spiritual mediums show a survival of the art. The word is popularly applied to magicians generally, it being thought, through a false etymology, to refer to workers of the "black art."

**Necropolis.** The city of the dead. Applied to the cemeteries in the vicinity of ancient cities. In classical antiquity



Monument in the Royal Necropolis at Golconda, India.

only applied to a suburb of Alexandria where the corpses were received and embalmed. Here Cleopatra applied the asp to her breast.

**Necrosis.** Local tissue death, caused by the arrest of nutrition to the part. The term is generally applied to mortification or death of bone. It corresponds to gangrene of the soft parts and like it is acute and chronic, dry and moist, inflammatory, senile, etc.

**Nectanebo.** I. King of Egypt 386–368 B.C.; at war with Persia.—II. King 361–349 B.C.; expelled and succeeded by Persians.

**Nectar.** Saccharine fluid secreted by certain glands borne for the most part within the flowers of many plants, but also in some cases on the leaves, peduncles, or other organs. Bees collect this substance and transform it into honey.—In Mythology, drink of the gods.

**Nectar-Guides.** Markings in certain flowers which lead to the nectar-secreting glands.

**Nectaries.** Receptacles for the collection and accumulation of nectar, borne in certain flowers: with older writers, petals of very irregular form.

**Nectarine.** Variety of the Peach, *Amygdalus persica*, differing from that fruit in having a smooth skin.

**Nectocalyces.** Medusoid polyps, situated beneath the pneumatophore of certain Siphonophores. They are without mouth, manubrium, tentacles, and sense organs.

**Nectocalycine Canals.** Radiating and circular gastrovascular canals in a Medusa or medusoid polyp.

**Nectocalyx.** Swimming-bell, or general body, of a Medusa.

**Nectosac.** Sub-umbrellar or bell-cavity of the nectocalyx of a Siphonophore.

**Necturus.** See MENOBRANCHUS.

**Needham,** JOHN, d. ab.1786. English hymnist.

**Needle.** Tool used in charging holes for blasting; when withdrawn, it leaves an open channel through which fire is communicated to the explosive used.

**Needle-Gun.** Breech-loading rifled musket used by Prussia first 1848, and afterward by the German infantry until superseded by the Mauser rifle. Its cartridge was discharged by a central bolt, or needle-shaped rod, striking against the detonating charge in the base of the cartridge.

**Needles.** Bone needles with eyes are found in the reindeer caves of France and lake dwellings of central Europe. Bronze needles have been found in Egypt. Some savage tribes make needles without eyes, but instead have a pin-like head, around which the thread is passed. Surgical needles are found in the ruins of Pompeii. Steel needles were made in 1370 at Nuremberg. Modern needles are made at a single operation. The tempered wire is fed into a machine, which cuts off the proper length, points it, drills the eye, polishes, counts, and puts them in papers ready for the market.

**Needles,** THE. Three rocks of chalk off the w. end of the Isle of Wight. On the cape behind is the N. lighthouse.

**Needle Work.** See BAYEUX, EMBROIDERY, LACE, and TAPESTRY.

**Neele,** HENRY, 1798–1828. English poet and critic. *Romance of History*, 1827.

**Neer,** AÁRT VAN DER, 1603–1677. Dutch landscape painter. He represented mostly canals with towns on their banks

Moonlight, by Neer.

lighted by the moon, and no other painter has depicted the lights and shadows of such scenes with so much truthfulness and clearness.

**Neerwinden.** Village of Liege, Belgium, scene of two battles. 1. July 29, 1693; the French under Luxembourg defeated William III. of England. 2. March 18, 1793; the French under Dumouriez were defeated by the Allies under the Prince of Coburg.

**Neesima,** JOSEPH HARDY, 1843–1890. Japanese missionary; pres. Doshisha Coll., Kioto.

**Nees von Esenbeck,** CHRISTIAN GOTTFRIED DANIEL, 1776–1858. Prof. of Botany at Erlangen 1818, and Breslau 1830–52. *Systema Laurinarum*, 1836; *Naturphilosophie*, 1841.

**Ne Exeat.** Writ prohibiting one from leaving a specified jurisdiction; abolished in N. Y. and some other States.

**Nef,** JOHN ULRIC, b. 1862. Prof. of Chemistry Purdue Univ. 1887–89, Clark Univ. 1889–92, and Univ. Chicago 1892.

**Neff,** FÉLIX, 1798–1829. Evangelist and civilizer of the Hautes-Alpes.

**Negapatam,** or NAGAPATAM. Town of s. India, on Gulf of Bengal, 180 m. s. of Madras; held by the British since 1781, previously by the Dutch. Pop., 1891, 59,200.

**Negative Crystal.** Doubly refractive crystal, in which the index of refraction for the ordinary ray is greater than that for the extraordinary ray; sometimes called repulsive crystal.

**Negative Eyepiece** FOR TELESCOPES. This consists of two plane convex lenses, the convex side being turned toward the object-glass. They are so placed that the principal focus of the object-glass falls between the lenses.

**Negative Quantity.** One having the minus sign; opposed to positive quantity.

**Neglect of Duty.** In U. S. Army, punishable at the discretion of a court-martial, the charge being laid under the 62d article of war.

**Negley,** JAMES SCOTT, b. 1826. Brig.-gen. U. S. Vols. 1861, Major-gen. 1862; distinguished at Stone River and Chickamauga; M.C. from Pa. 1869–75 and 1885–87.

**Negligence.** Failure to use ordinary care and skill toward one to whom such care or skill are due, causing actionable injury to him. It may be so great as to subject the negligent person to criminal prosecution. The subject is of great importance in modern law.

**Negotiable Instruments.** Written contracts whose transferee may enforce them in his own name free from equities between prior parties, provided he takes them without notice of equities, for value and before due. The earliest form was the bill of exchange, but promissory notes, bankers' notes, checks, corporate bonds, and other instruments have been declared negotiable.

**Negri,** ADA, b. 1871. Italian peasant-poet, now teaching at Milan. *Fatalità*, 1892.

**Negri,** PAOLO, b. 1853. Prof. Venice from 1886; writer on Obstetrics.

**Negritos** (AETAS or ITA). Aborigines scattered among the Malays of the Philippines and Malacca. They are related to the PAPUANS (q.v.), are of dark color, short stature, and have weak legs, with prehensile toes. The jaws are prominent, nose flat, and hair woolly. Tattooing is practiced. Monogamy is the rule. Their weapons are bows, arrows, and knives.

**Negro,** RIO. Left branch of the Amazon, heading in the Andes and flowing e. and s.e. through Colombia and Brazil; mostly navigable. Length ab. 1,350 m.

**Negro,** RIO. In Argentina, flowing mostly e. from Andes to Atlantic. Length ab. 650 m.

**Negro Music in America.** The strong musical instincts of the African peoples who were brought as slaves to America were greatly stimulated by plantation life, and as a result a characteristic folk-song grew up in the slave States. While these songs, secular as well as religious, show the influence of the ballads and hymns which the slaves heard in the homes of their masters, they bear unmistakable relics of their African origin. They are largely based on the pentonic or five-note scale, in which the fourth and seventh tones of the diatonic series are omitted, and in this respect resemble old Celtic and Chinese music. Other characteristics are a fondness for a flat seventh in the major mode, and the rhythmical device familiarly known as the Scot's snap or catch, a figure in which the emphasis is shifted from the strong to the weak part of a measure by giving the accented note only a fraction of the time of the note following, as, *e.g.*, an eighth note and a dotted quarter. African relics are also found in the words of songs occasionally heard in connection with what are called Voodoo rites. Much of the charm found in the minstrel songs of Stephen C. Foster and others is due to their imitation of the characteristic elements of Negro songs.

**Negro Plot.** In New York in 1741 several fires, aided by two pretended confessions, induced a belief that the negro slaves, who then constituted ab. one-fifth of the population, had banded together to burn the town and murder the whites. An insane panic, affecting lawyers and judges, resulted in the burning of 13 negroes, the hanging of 18, and the transportation of 71, besides the execution of a white schoolmaster.

**Negropont.** See EUBŒA.

**Negro Race.** Darkest of the five great races of Man. The color of their skin is due to the same pigment as in the Caucasian races, and varies in different tribes, approaching black only in a few, while in others the color is less dark than in some Caucasians, Indians, etc. This race is represented by the peoples of Africa from the Sahara to the country of the HOTTENTOTS and BUSHMEN (q.v.) near the Cape, these being distinct

1.—Negro of Timbuctoo.
2.—Negro of the Central Niger.
3.—Negro of the Soudan.
4.—Profile of same.

from Negroes proper. The NEGRITOS of the Philippines and PAPUANS of Melanesia (q.v.) are of common origin with the Negroes, their cradle being placed by Sclater in the hypothetical continent of Lemuria now submerged beneath the Indian Ocean. The African tribes are not of pure descent, especially are those living near the Sahara intermixed with Hamitic and Semitic blood, and the Bantu languages of S. Africa show for-

eign derivation. The Negro race is thus characterized: legs, weakly developed; great toe, partly prehensile; arms, long; skulls, prognathus and dolichocephalic; facial angle 70° (in Caucasians, 82°), wt. of brain, 35 oz. (in Gorilla 20, and average European 45); nose depressed, with dilated nostrils and concave bridge; cheek-bones and lips prominent; cranial bones extra thick; head covered with short curly wool, not true hair; skin with sparse development of hairs and secreting a peculiar odor. The race is emotional, susceptible to external influences, weak in moral perceptions, undeveloped both religiously and politically. Some tribes are cannibals. Population, ab. 130 millions in Africa, and 20 millions in other countries, of which U. S. contains 6½ millions and the W. I. islands nearly 4 millions. The offspring of parents, one of whom is black and the other white, is a mulatto; of a mulatto and a white, a quadroon; of a quadroon and a white, an octoroon. See also AFRICAN RACES, ASHANTI, BAYAKA, BECHUANA, DAHOMEY, KAFIRS, MATABELI, M'PONGWE, ZAMBESIANS, and ZULUS.

**Negros.** One of the Philippines, lat. 10° N.; discovered 1565. The people are mostly Malays. Area 4,700 sq. m., pop. ab. 245,000.

**Negro Suffrage.** The bill striking the word "white" from all the laws prescribing the qualifications of voters in the District of Columbia was passed in the Senate Dec. 13, 1866, vetoed by Pres. Johnson Jan. 7, 1867, passed over the veto by the Senate the same day, and by the House the day following, and so became a law. The 14th amendment to the Constitution, 1868, and the 15th, 1870, secured the right of suffrage to the negro race.

**Negruzzi,** CONSTANTIN, ab. 1809–1868. Roumanian poet and translator.—His son, JACOB, b. 1843, is also a poet.

**Negus.** English drink of sherry or port and hot water, with sugar, spices, and lemon-peel; invented by Francis Negus, d. 1732.

**Negus.** Title of the Abyssinian kings.

**Nehemiah.** Jewish cup-bearer of Artaxerxes, restorer of Jerusalem, ab. 444 B.C., and supposed author, at least in part, of the 16th O. T. book.

**Neher,** BERNHARD, 1806–1886. German historical painter.

**Neidhart von Reuenthal,** 13th cent. Bavarian poet.

**Neilgherry Hills.** Group in s. India, at the junction of the e. and w. Ghauts. Altitude of highest peak 8,760 ft.

**Neilreich,** AUGUST, 1803–1871. Austrian botanist. *Flora von Nieder-Oesterreich*, 1866; *Vegetationsverhältniss von Kroatien*, 1868.

**Neilson,** LILIAN ADELAIDE, 1850–1880. English actress, prominent from 1871.

**Nekrasov,** NIKOLAI, 1822–1877. Russian poet and satirist.

**Nélaton,** AUGUSTE, 1807–1873. Prof. of Surgery in Paris; Senator 1868. *Pathologie Chirurgicale*, 5 vols., 1844–60.

**Nelson,** HORATIO, VISCOUNT, 1758–1805. English Admiral 1801. He served in the Mediterranean against the French 1793–1800; destroyed the French fleet at Aboukir (Battle of the

Nelson.

Nile), Aug. 1, 1798; bore part at Copenhagen April 2, 1800, and defeated the French and Spanish fleets at Trafalgar, Oct. 21, 1805, where he was killed.—His grandnephew, HORATIO, third Earl, b. 1823, edited the *Sarum Hymnal*, 1857–68, containing a few good hymns of his own.

**Nelson,** JULIUS, Ph.D., b. 1858 in Copenhagen. Prof. of Biology in Rutgers Coll. and Biologist of N. J. State Agricultural College Experiment Station 1888. *Vertebrates of N. J.*, 1890; Annual Reports on *Oyster Culture*, 1888–92; on *Tuberculosis*, 1893–96; *Syllabus of Zoölogy*, 1893.

**Nelson,** KNUTE, b. ab. 1840 in Norway. M.C. 1883–89; Gov. of Minn. 1891–95; U. S. Senator 1895.

**Nelson,** ROBERT, 1656–1714. English nonjuror and devotional writer. His *Festivals and Fasts*, 1703, was long popular.

**Nelson,** SAMUEL, LL.D., 1792–1873. Judge of N.Y. Circuit Ct. 1823–31, of N.Y. Supreme Ct. 1831–45; Associate Justice of U.S. Supreme Ct. 1845–72.

**Nelson,** THOMAS, 1738–1789. Delegate to Congress 1776–77 and 1779; signer of the Declaration of Independence; Gov. of Va. 1781. His great fortune was absorbed by public debts for which his patriotism had become responsible.—His son, HUGH, 1768–1836, was M.C. from Va. 1811–23, and U. S. Minister to Spain 1823–24.

**Nelson River.** In Canada, connecting Lake Winnipeg with Hudson's Bay. Length ab. 400 m.

**Nelumbo.** Genus of large-flowered aquatic plants of the Water-Lily family, natives of Asia and N. America; known as Sacred Bean and Water Lotus. *N. lutea* of N. America is also called Water Chinquepin.

Nelumbo lutea.

**Nemalite.** Fibrous variety of the mineral BRUCITE (q.v.).

**Nemastomaceæ.** Order of *Algæ* of the sub-class *Rhodophyceæ*, of marine distribution.

**Nematheces.** Wart-like projections from the surface of certain seaweeds, containing reproductive organs or propagative spores.

**Nemathelminthes,** or NEMATHELMIA (ROUND WORMS). Vermes with tubular or thread-like bodies; the cuticle is frequently annulated, and the anterior end has hooks or suckers. They are diœcious. They are divided into the NEMATODA, CHÆTOGNATHA, and ACANTHOCEPHALA (q.v.).

**Nematocalyces.** Small accessory hydrothecæ on the nutritive polyps of certain campanularian Hydroids, which are filled with nematocysts.

**Nematocysts.** Thread cells or nettle cells of Jelly-fishes.

**Nematoda** (THREAD WORMS). Nemathelminthes with a mouth and an intestine; usually parasitic. They have a cuticle, which is often annulated, and a muscular hypodermis. The principal families are ASCARIDÆ, STRONGYLIDÆ, TRICHOTRACHELIDÆ (of which *Trichina* of pork is typical), FILARIIDÆ, GORDIIDÆ, and ANGUILLIDÆ (q.v.).

**Nematode Root-Galls.** Galls which progressively decay are formed on the roots of nearly all the common garden vegetables. They are caused by nematode worms: *e.g.*, *Heterodera radicolla*, which thrives best in rich soils. As a remedy, salting the soil has been recommended.

**Nematognathi.** Group of physostome fishes, including forms with abdominal pelvic fins, naked skin, or with bony plates and no scales. The group is closely related to the *Chondrostei*, and includes the fresh-water Cat-Fish or Bull-Head.

**Nematophora.** See CNIDARIA.

**Nematophores.** Cup-shaped processes of certain Sertularians, loaded with nettle cells, and also naked, protoplasmic cells that extend amœboid pseudopodia.

**Nematorhyncha.** Group of nematoid worms, including *Chætonotus* and its allies (which are ciliated on the ventral surface and hence known as the *Gastrotricha*), and *Echinoderes*, which is unciliated and therefore constitutes the group *Atricha*.

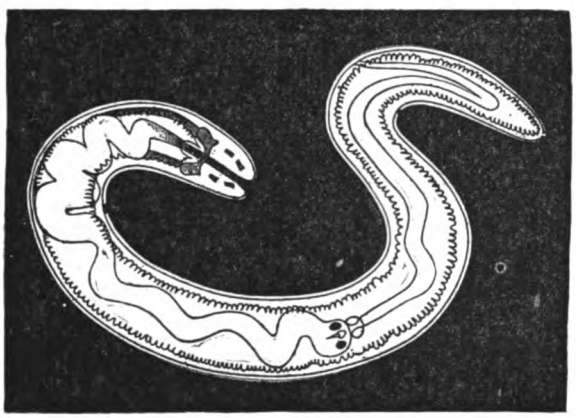
**Nematoscolices.** Group of *Vermes*, including the NEMATHELMINTHS and NEMATORHYNCHA (q.v.).

**Nemcová,** BOZENA, 1820–1862, m. 1837. Bohemian novelist. *The Grandmother*, 1855, tr. 1891; *Slovak Folk-tales*, 1858.

**Nemea.** Ancient city of Argolis. Three columns of the temple of Zeus yet stand.

**Nemean Games.** Greek biennial festival in honor of Zeus; at first of warlike character and open only to warriors and their sons, afterward thrown open. The exercises were much the same as at Olympia; the prize, an olive chaplet, and later, one of green parsley. They were still celebrated in Hadrian's time.

**Nemertea** (NEMERTINI, RHYNCHOCŒLA). Class of *Vermes*, more or less flattened in shape of body, the skin ciliated; there is a pair of ciliated pits leading to special lobes of the brain. The intestine is straight; there is a protrusible proboscis above the mouth. The nervous and blood systems are fairly developed. The sexes are separate, and the development is sometimes accompanied by metamorphosis, through a Pilidium stage. They are nearly all marine, and have been classified into the *Enopla* and *Anopla*, according to whether the proboscis was armed with stylets or not; also into *Rhagophora* and *Arhagea*, with or without ciliated grooves on the head. Hubrecht's classification is PALÆONEMERTEA, SCHIZONEMERTEA, and HAPLONEMERTEA (q.v.).



Nemertea (*Tretrastemma agricola*).

**Nemesianus,** MARCUS AURELIUS OLYMPIUS, 3d cent. Writer of Latin poems upon fishing, hunting and aquatics. Fragments of his *Cynegetica* remain.

**Nemesis.** Greek goddess of retribution, daughter of Night and punisher of sins.

**Nemi.** Lake in the Alban Mts., 20 m. s. of Rome, site of an ancient town and temple of Diana; celebrated in Rénan's *Priest of Nemi*.

**Nemocera** (TIPULARIÆ). Sub-order of *Diptera*, including elongated flies, with long antennæ sometimes tufted in the male. The wings are naked or hairy, and the legs long. The proboscis is short, fleshy, and often armed with piercing bristles. The larvæ have usually a distinct head and sometimes a jaw-sheath. They live in galls, in fungi, or in water. In the last case, when hatched from the pupa the fly rests on the floating pupa-skin as a boat, until the wings become hard. To this group belong the blood-sucking Gnats and the Gall-flies (*Gallicolæ*).

**Nemours,** LOUIS CHARLES PHILIPPE RAPHAEL D'ORLEANS, DUC DE, b. 1814. Second son of Louis Philippe; in England 1848–70; gen. of division 1870–86.

**Nemours,** TREATY OF. Concluded July 7, 1585, between Henry III. of France and the chiefs of the League. The king revoked the edicts of tolerance previously granted to the Huguenots.

**Nencioni,** ENRICO, b. 1840. Italian poet and critic of the Carducci school. *Poesie*, 1878; *Medaglioni*, 1885.

**Nennius.** Reputed author, probably Welsh, of a *Historia Britonum*, extending from mythical times to 655, and tr. 1848.

**Neocarida.** See CRUSTACEA.

**Neocene.** Miocene and Pliocene taken together; geologic period after the Eocene.

**Neo-Crinoids.** See CRINOIDEA.

**Neodymium.** Nd. At. wt. 140.8. Principal constituent of didymium; discovered by Carl Auer von Welsbach 1885. The salts are very similar to those of didymium, being of a reddish-violet color and showing a characteristic absorption spectrum.

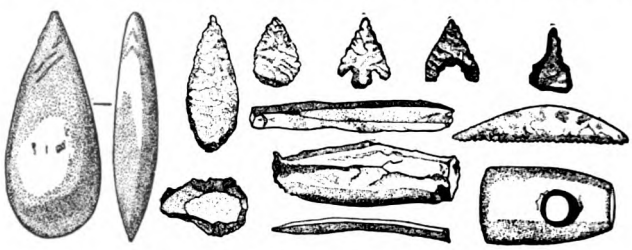
**Neodymium Oxide.** $Nd_2O_3$. Apparently the only oxide which neodymium forms; blue powder, soluble in acids.

**Neo-Grammarians.** Term applied by Zarncke to the new school of philologists which arose in Berlin ab. 1877.

**Neo-Grec.** Style of architecture attempted by some French architects ab. 1850, to introduce Greek lines in modern buildings without copying the features which exhibited them. A number of public and private buildings in France were produced in this style, and a considerable number of dwellings in the U. S. by architects educated in France and their pupils. But the movement which resulted in these works was neither extensive nor durable, and for twenty years no noteworthy attempt has been made in pursuance of it.

**Neo-Lamarckianism.** Doctrines of an American school of naturalists, who hold that acquirements through use and losses through disuse of organs are hereditary; also that exercise of a part to meet a special need will produce a definite variation in the offspring toward development in the desired direction. See LAMARCKIANISM and DARWINISM.

**Neolithic Caves.** These are widely spread over Europe and were used as habitations by the early races who invaded Europe from the East. The first was discovered 1869, and several others soon after. These contain, as relics or fossils, polished stone implements, rude pottery, human skeletons, broken bones of domestic animals, remains of wild animals, as the fox, wolf, badger, bear, boar, stag, roe, hare, rabbit, which had been used for food. The caves were subsequently used as tombs, receiving regular interments, the bodies being buried in a contracted posture. The tallest skeleton was only 5 ft. 6 in. high, the shortest being 4 ft. 10 in. The skulls are orthognathic and oval, with oval face. Some of the shinbones were platycnemic. Caves containing remains of this character have been found from Ireland to Gibraltar. The cairns and tumuli found scattered over Ireland, England, etc., show evidences of having been constructed by a similar race. On the Continent are caves that also have remains of a brachycephalic or Celtic type, representing an invasion of conquering Gauls of taller stature, who drove the Iberians before them into Wales on the north, and the Pyrenees south. See KENT'S CAVERN.



Neolithic Implements.

**Neolithic Man.** Prehistoric man of the later Stone Age. The implements, etc., of this period were made of stone, usually carefully polished, and of considerable variety. Wood, horn, and bone were also extensively used and the arts of pottery practiced. At the close of the period, copper, bronze and finally iron was in use, and then dawned the historic period. Shell-heaps (kitchen-middens) and the LAKE DWELLINGS (q.v.) belong to this period. The most dominant of European people of the neolithic age is probably represented at present by such remnants as the Basques, though it is probable that considerable amalgamation with immigrating tribes occurred in different parts of the Continent. In America the corresponding race may be said to be the MOUND-BUILDERS (q.v.); compare PALEOLITHIC MAN.

**Neomeniæ.** Slug-like Mollusk, without shell, but with spicules. The mantle is reduced to a collar around the mouth. There are comb-like gills at the sides of the anus. The foot is small and sunk in a groove. The radula is many-toothed: the reproductive cells (gonads) are discharged by means of the segmental ducts. See ISOPLEURA.

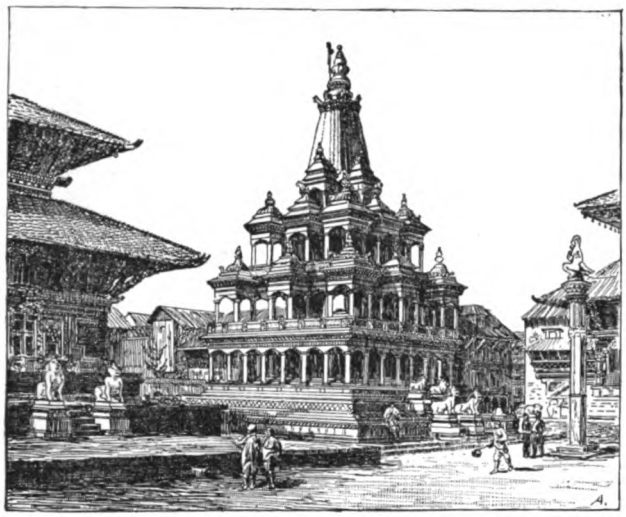
**Neophyte.** Name used by St. Paul, I. Tim. iii. 6, for persons recently converted to Christianity. It was applied by the Romans to newly ordained priests or to novices of a religious order.

**Neo-Platonism.** Revival of Platonism as a theosophy, fused with magic, theurgy, and popular mythology. Its period was ab. 175–530; it yielded at last to Christianity, which it strongly tinged. Its chief teachers were Ammonius Saccas, Plotinus, Porphyry, Iamblichus, and Proclus.

**Neotropical Province.** Zoölogical region including the W. Indies and America s. of Mexico. Its characteristic ani-

mals are Platyrrhine Monkeys, Llamas, Peccaries, Sloths, Anteaters, Armadillos, Curassow, etc. There is an absence of *Insectivora*, Goats, Antelopes, Oxen, Cranes, etc. The Opossums are common to this and the Nearctic Province.

**Nepal,** or NEPAUL. Independent kingdom of n. India, adjoining the Himalayas; conquered by the Goorkhas 1769; allied



Temple in Nepal.

to Gt. Britain since ab. 1820. The climate has all varieties, from lowland to mountain. Capital Khatmandu; area 54,000 sq. m., pop. ab. 2,500,000.

**Nepenthaceæ.** Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Dicotyledons*, including 1 genus and ab. 31 species, mostly with tubular or pitcher-like leaves, natives of the tropics of the e. hemisphere, especially in the Malayan Archipelago.

**Nepheline,** or NEPHELITE. Mineral in some respects analogous to an alkaline feldspar in composition, though containing a relatively smaller percentage of silica and differing from feldspar in crystalline form, frequently met as an essential constituent of some volcanic and crystalline rocks.

**Nephoscope.** Any apparatus for accurate observation of the velocity and direction of motion of clouds.

**Nephridia.** See SEGMENTAL ORGANS.

**Nephrite.** Tough, fine-grained, whitish or greenish, non-aluminous variety of the mineral amphibole; also the mineral saussurite and some others. Etymologically, the word signifies kidney-stone: the mineral was supposed to possess curative properties in connection with diseases of the kidneys.

**Nephritis.** Inflammation of the kidneys, Bright's disease. There are acute and chronic forms. Acute nephritis, caused by exposure; poisons of specific fevers, as scarlet fever and diphtheria; toxic agents, as cantharides; pregnancy, etc. It is characterized by dropsy, scanty dark-colored urine, pain in back, and more or less febrile symptoms. Chronic nephritis may follow an acute attack or occur insidiously as a primary disease, the result of intemperance, or without apparent cause. Two forms are recognized: Parynchymatous and Interstitial. The former, more common among young adults, is characterized by obstinate dropsy and has an earlier and more fatal termination: the latter, more frequent in old age, without marked dropsy, seldom recognized in the early stage and runs a much slower course.

**Nephrostome.** Peritoneal funnel or opening of a nephridium into the body cavity.

**Nephthys.** Egyptian goddess of the dead; sister and wife of Set, mother of Anubis, and comrade of Isis.

**Nepigon.** Canadian lake n. of Lake Superior; ab. 70 m. by 5; resort of fishermen.

**Nepomuk,** JOHN, ab. 1330–1383. Court preacher at Prague, martyred by Wenceslas IV. for refusing to disclose the queen's confessions; canonized 1729; patron saint of Bohemia. His day is May 16.

**Nepos,** CORNELIUS, 1st cent. B.C. Latin writer of a series of historical works, of which a number of biographies are extant. His Latinity is pure and his style good.

**Nepotism.** Misuse of trust by Nicholas III. (1277–80) and other popes, as before and since by many dignitaries in all countries, in bestowing lucrative posts on their relatives.

**Neptune.** Identified with Poseidon; Roman god of the Mediterranean Sea, son of Saturn, and brother of Jupiter. Earth-

Neptune.

quakes were attributed to his subterranean force. Agrippa erected the Poseidonium in his honor. His festival was July 23.

**Neptune.** Most remote of the planets. Distance from the sun 2,792,000,000 m.; diameter 34,800 m.; mass 17.1 that of the earth; density 1.11 that of water; time of revolution about the sun 164.78 years. It was discovered by Galle at Berlin Sept. 23, 1846, within 52′ of the place predicted by Leverrier from the perturbations produced in Uranus. (See also ADAMS, JOHN C.) It was found that the planet had been observed six times before this date, the observers supposing it a fixed star. There is one satellite, distant from the planet 225,000 m.; period 5d. 21h. 2m. 44.2s. The motion is retrograde; inclination of satellite's orbit to plane of ecliptic 34° 48′.

**Neptunism.** Theory that the strata composing the crust of the earth have been each in succession universally precipitated from a common chaotic fluid; first propounded by Werner, who derived it from the study of the rocks near Freiburg in Saxony, and freely introduced catastrophe to explain or remove difficulties in his generalizations. His genius threw a glamour over views based on a too narrow induction: his followers were many and zealous, impatient of opposition, and bitter in their controversy with the Vulcanists.

**Nerbudda.** River of Central India, flowing w. to Gulf of Cambay; navigable for ab. 60 m. Length ab. 700 m., drainage area ab. 36,000 sq. m.

**Nereids.** Daughters of the sea-god Nereus. See NYMPHS.

**Nereis.** See ERRANTIA.

**Neri.** Name assumed by the Guelph or aristocratic party in Florence, under Corso Donati, ab. 1300. The old Ghibellines took the name of Bianchi (*White*).

**Neri,** FILIPPO, 1515–1595. Founder, 1575, of the *Congregazione dell' Oratorio*, which gave rise to the art form known as oratorio; canonized 1622.

**Nero,** LUCIUS DOMITIUS, 37–68. Fifth Roman emperor; son of Ahenobarbus and Agrippina, daughter of Germanicus; pupil of Seneca; adopted 50 by Claudius. He married Octavia, daughter of Claudius, whom he succeeded 54; put to death Britannicus son of Claudius, his own mother and wife, and married his mistress Poppæa; rebuilt Rome after the great fire of 64, which some supposed was set by his orders; and persecuted the Christians, to divert the odium of the deed from himself. His brutal cruelty led in 65 to a plot against him, for which Piso, Lucan, Seneca, and others were put to death. In 68 Vindex in Gaul and Galba in Spain revolted: Nero was deserted, fled from Rome, and killed himself.

Nero.

**Neroli,** OIL OF. Volatile oil, obtained from the flowers of the sweet and bitter orange, the latter preferred, when distilled with water. It is a constituent of cologne and other perfumes.

**Neruda,** JAN, 1834–1891. Bohemian poet, dramatist and novelist.

**Nerva,** MARCUS COCCEIUS, 32–98. Eleventh Roman emperor, succeeding Domitian 96; of high character, fair abilities, and

lenient temper, frugal and tolerant. He adopted Trajan, and initiated the happy period of the five good emperors.

**Nerval,** GIRARD DE (LABRUNIE), 1808–1855. French poet and dramatist, tr. *Faust*, 1828; *Aurelius*, 1855.

**Nervation.** See VENATION.

**Nerves.** These are cords, composed of fibrillar albuminous tissue, extending from ganglionic centers of the brain and spinal cord to other ganglia and plexuses, and to peripheral organs, establishing a system of communication between every portion of the body, and uniting it to a single center, from which the functions of the organism are controlled.

**Nerves** (IN BOTANY). See VEINS.

**Nervii.** Fierce Gallic tribe, formerly occupying territory corresponding to French Flanders, Hainault and Cambresis. Cæsar subdued them with difficulty.

**Nervous Diseases.** The complexity of the nervous system renders its diseases more varied than any other system in the body. The principal ones are meningitis, encephalitis, myelitis, neuritis, hydrocephalis, apoplexy, paralysis, locomotor ataxia, chorea, convulsions, epilepsy, migrane, neuralgia, tetany, hysteria, and neurasthenia. See under their respective titles.

**Nervous System.** Consists in all vertebrated animals of two distinct systems, the cerebro-spinal and sympathetic or ganglionic. The cerebro-spinal system includes the brain and spinal cord and the cranial and spinal nerves and ganglia connected with them. The sympathetic system, indirectly connected with the former through numerous communications with the cranial and spinal nerves, consists of a chain of ganglia on each side of the spinal column with the branches which go to and come from them.

**Nervures.** Ribs or "nerves" of the insect's wing.

**Nesselrode,** KARL ROBERT, COUNT, 1780–1862. Russian diplomatist, prominent in European affairs 1812–56; Chancellor from 1844. *Autobiography*, 1866.

**Nessler,** VICTOR ERNST, 1841–1890. German musician, who won sudden and wide popularity with his opera, *Der Trompeter von Säkkingen*, 1884.

**Nessler's Reagent.** Alkaline solution of mercuric iodide in potassium iodide; used in water analysis to detect the presence of ammonia, a very minute quantity of which will give a distinct yellow coloration to the liquid.

**Nessus.** Centaur who, having offered violence to Deianira, wife of Hercules, was slain with a poisoned arrow. He persuaded her to use his blood as a means to preserve her husband's love; a garment steeped in it caused Hercules to die in agony.

**Nest.** Local segregation of a small quantity of ore.

**Nestor.** Ruler of Pylos, renowned for valor in youth, and in old age for wisdom. He joined the expedition against Troy with 60 ships, and was chief adviser of the Greek chiefs.

**Nestor,** ab. 1056–1115. Russian monk of Kiev, author of a *Chronicle* which extends to his own time and is highly valued.

**Nestorians.** Eastern Christians who denied the œcumenicity of the Council of Ephesus 431, which condemned Nestorius. They took refuge in Persia, and in the Middle Ages filled e. Asia with missions. Now ab. 70,000.

Nestorian Family from Hakkari.

**Nestorius.** Patriarch of Constantinople 428–431, deposed by Third General Council as teaching two persons in Christ, and banished 435.

**Net Advantages.** Reward which any occupation offers to labor, found by deducting the money value of all its expenses and drawbacks from that of all its benefits.

**Netherlands.** Kingdom of w. Europe, between Germany and the North Sea. The region was anciently occupied by Frisians and Batavians; the Franks followed, ab. 300. In 1387 Flanders became subject to the Duke of Burgundy. Under Philip the Good, Holland and other provinces were added; all were united under Charles V., who encouraged commerce and shipping. The tyranny and persecutions of Philip II. stirred up rebellion, ending 1609 in the establishment of the Republic of the United Provinces, under the Prince of Orange, the Belgic provinces remaining subject to Spain. Commerce began to extend to distant parts. A contest between Arminians and Calvinists assumed political importance in the 17th cent. In 1793 French armies took possession, and the United Provinces became the Batavian Republic. Louis Bonaparte became King of Holland 1806: in 1810 it was added to the French empire. The Orange family was recalled on the fall of Napoleon, and the provinces were united for a time in the kingdom of the Netherlands. Belgium seceded 1830. A new constitution was granted 1848. Area, 12,656 sq. m.; pop., 1892, 4,699,576; capital, Amsterdam. See HOLLAND.

**Nethinim.** Menial servants of the Hebrew Temple, probably descendants of the Gibeonites.

**Net Income.** That which remains from the gross produce of a business after deducting wages, price of raw materials, interest, depreciation, and insurance on capital.

**Netscher,** CASPAR, 1639–1684. Genre painter of German birth and Dutch School. In the latter part of his life he painted portraits, in which he excelled. His works are largely distributed and of very equal merit.

Caspar Netscher.

**Netsuke.** Carved buttons, used in Japan for suspending the tobacco pouch and medicine or perfume box from the belt; frequently made of ivory and semi-precious materials, and valued by both native and foreign collectors as objects of art.

**Nettement,** ALFRED FRANÇOIS, 1805–1869. Parisian journalist, who pub. much on modern French history. *The Restoration*, 8 vols., 1860–72.

**Netter,** THOMAS, ab. 1380–1430. Provincial of the English Carmelites 1414. He wrote against Wiclif and the Lollards.

**Nettle.** Plants of the genus *Urtica*, of the Nettle family, provided with peculiar glands which secrete an irritating fluid, natives of the n. hemisphere, widely distributed as weeds.

**Nettle,** DEAD. *Galeopsis tetrahit.* Coarse weed of the Mint family, native of Europe, introduced into N. America.

**Nettle,** FALSE. *Bœhmeria cylindrica.* Swamp herb of e. N. America, of the Nettle family, but not stinging.

**Nettle,** WOOD. *Urticastrum divaricatum; Laportea canadensis.* Large, stinging herb of the Nettle family, native of woodlands in e. N. America.

**Nettle-Cells.** Occurring on the tentacles, mesenteries, etc., of cœlenterates for purposes of defense and the procuring of food. Each contains a coiled thread which is released on irritation and shot into the intruder's body. They are also called thread-cells and nematocysts.

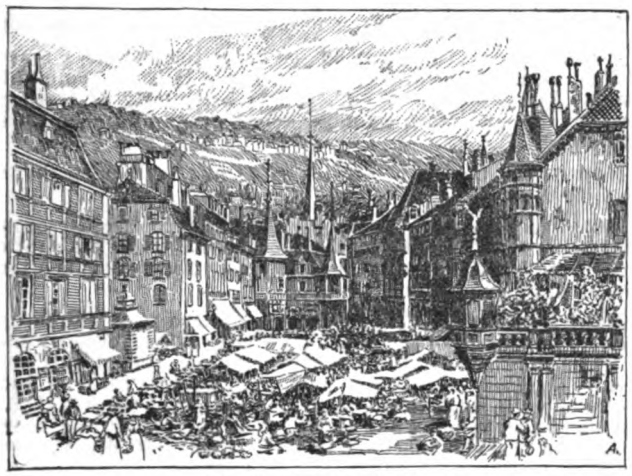
**Nettle Rash.** See HIVES and URTICARIA.

**Nettleship,** HENRY, 1839–1893. Latin prof. at Oxford 1878. *Latin Lexicography*, 1889.

**Nettleton,** ASAHEL, D.D., 1783–1844. New England evangelist; compiler of the widely used and influential *Village Hymns*, 1824.

**Nettle-Tree.** *Celtis australis.* Tree of the Elm family, native of the Mediterranean region. See HACKBERRY.

**Neuchâtel,** or NEUFCHATEL. Canton of w. Switzerland, once part of Burgundy; held by Prussia 1707–1806 and 1814–57. Berthier was its prince 1806–14, under Napoleon. Area 306 sq.



Market-Place, Neuchatel.

m., pop. ab.115,000. The lake, which forms its s.e. boundary, is 25 by ab. 4 m.—Neuchatel Cheese comes from a town in n. France, 25 m. s.e. of Dieppe.

**Neuendorff,** ADOLPH HEINRICH, b. 1843. German-American musician, operatic conductor, and composer.

**Neukomm,** SIGISMUND, 1778–1858. German musician, composer of oratorios, masses, services, etc. His oratorio *David* enjoyed a marvelous popularity in New England in the early days of choral societies.

**Neumann,** FRANK ERNST, b. 1798. Prof. Physics and Mineralogy Univ. Königsberg 1828.

**Neumann,** KARL FRIEDRICH, 1798–1870. German Orientalist; prof. Munich 1831–52; translator of Armenian histories; voluminous writer.

**Neumann's Law.** For compound substances; similar to Dulong and Petit's law for elementary substances. For compound substances having a similar chemical composition and an analogous constitution, "the product of the specific heat and the molecular mass is approximately a constant." It was published 1831 by F. E. Neumann.

**Neumark,** GEORG, 1621–1681. German hymnist.

**Neumayer,** GEORG, b. 1826. German meteorologist, long in Australia.

**Neupert,** EDMUND, 1842–1888. Norwegian pianist and composer.

**Neural Flexure.** Change in direction which the axis of the central nervous system suffers in passing from the medulla into the brain, in higher vertebrates; it is greatest in man.

**Neuralgia.** Painful affection of the nerves due to functional disturbance or neuritis. Some of the principal causes are debility, anemia, malaria, and careous teeth.

**Neurenteric Canal.** Passage from the Medullary Canal, or canalis centralis of the spinal cord, into and continuous with the lumen of the hind-gut, as seen in the early stages of embryonic development of Vertebrates. The common passage including both canals is the neurenteron.

**Neurine.** See CHOLINE (q.v.).

**Neuritis.** Inflammation of the nerve fibers. Localized when confined to a single nerve, and multiple when involving a large number of nerves. Localized neuritis, caused by exposure and traumatism, is characterized by inflammatory symptoms and sometimes an eruption (herpes) along the courses of the affected nerve. Multiple neuritis is spontaneous or due to toxic agents as alcohol, arsenic, etc., and the infectious fevers. The symptoms are pain, tenderness of the nerves and muscles, anæsthesia, motor paralysis, spasms, cramps, etc. Endemic neuritis, beri-beri, a form of multiple neuritis, is a widely spread disease in parts of India, China and Japan.

**Neuro-epithelial Cells.** Epithelium cells that also have nervous processes.

**Neurology.** Branch of Anatomy which treats of the nervous system; also, in a wider sense, physiology of nerves. When the nervous system of different animals is systematically studied to discover and compare homologous parts we have the science of Comparative Neurology.

**Neuromeres.** Segments of the vertebrate head as shown by the arrangement of the cranial nerves.

**Neuro-muscular Cells.** In Hydroids, much like the MYOBLASTS (q.v.); they have slender processes.

**Neuropodia.** Those parapodia that are borne on the ventral side of the annelid's segments; ventral part of a parapodium.

**Neuroptera.** Insects, with membranous wings, whose nervures form a network. The prothorax is free; the mouth parts are adapted for biting or sucking. The metamorphosis is complete, *i.e.*, the young pass through a pupa stage. There are two sub-orders, *Planipennia* and *Trichoptera.*

**Neuroses.** Functional affections of the nervous system; affections leaving no anatomical lesion. They may be classed as: general neuroses, including chorea, epilepsy, hysteria, etc.; occupation neuroses, of which writer's cramp is the most common; and traumatic neuroses, conditions known as "railway brain" and "railway spine."

**Neurotics.** Drugs which have a special action upon nerve centers and functions. Examples are alcohol, opium and strychnine.

**Neuse River.** In N. C. It heads and has its course in the Atlantic plain, and empties into Pamlico Sound. Length ab. 300 m., drainage area 5,300 sq. m.

**Neuss.** Town in Prussia on the Rhine, at the confluence of the Erft, 3½ m. s.w. of Dusseldorf. It is the Novesium of the Romans, and mentioned by them as a town of considerable im-

Neuss.—Upper Gate, with the Drusus Tower.

portance. Picturesque traces of the Roman period have been preserved at the Upper Gate, in the ruins of the Drusus Tower. Pop. 20,200.

**Neustria.** W. part of Frankish empire, 511–912. It extended from the mouth of the Scheldt to the Loire, n. of Aquitania, and w. of Burgundy and Austrasia.

**Neutral.** Flowers bearing neither stamens nor pistils.

**Neutral Axis.** Line drawn horizontally through the center of gravity of the cross-section of a beam; on this line there are no longitudinal strains or stresses.

**Neutrality.** Treating as friends nations which are at war, and refraining from assisting either belligerent directly or indirectly. Every nation has the right to remain neutral and to have its neutral trade interfered with as little as possible by belligerents. This right was not recognized by England and France during the Napoleonic wars, but its subsequent universal recognition was largely due to Washington's proclamation, April 22, 1793.

**Neutral Point.** Point of temperature at which a given pair of metals have the same thermo-electric power, and beyond which consequently their potential differences are reversed in sign. The maximum potential difference is obtained when one of the junctions is at this temperature and the other is as far away from it as possible.

**Neutral Salts.** See SALTS.

**Neuville,** ALPHONSE MARIE DE, 1836–1885. French battle-painter.

**Neuville,** JEAN GUILLAUME DE, 1776–1847. French royalist agent 1793; in N. J. 1806–14; Minister to the U. S. 1816–21, and to Portugal 1823–24; Baron 1821; Sec. Navy 1828–30.

**Neuville,** PHILIPPE BUACHE DE LA, 1700–1773. French geographer, as was also his nephew, JEAN NICOLAS, 1741–1825.

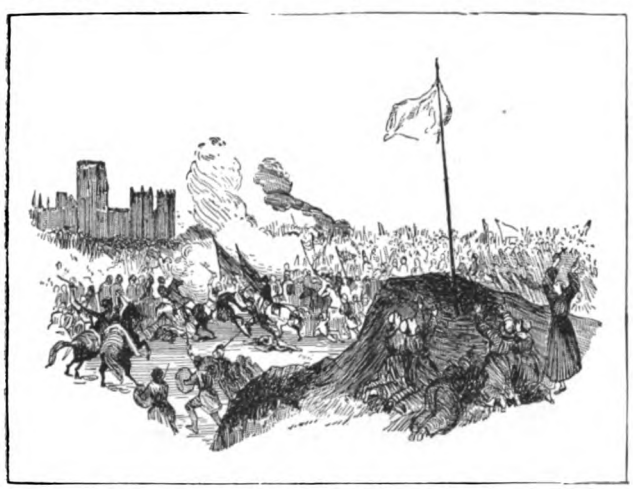
**Neva.** River of w. Russia, flowing from Lake Ladoga to the Gulf of Finland, past St. Petersburg. Length 40 m.

**Nevada.** One of the w. States. Its area is 110,700 sq. m. It lies almost entirely within the Great Basin, only a small area in its s. part being drained to the Pacific. Its surface consists of an alternation of broad desert valleys and narrow abrupt mountain ranges. Its climate is arid. Its industries consist mainly of gold and silver mining. In its w. part is the famous Comstock lode, which has produced over $306,000,000 in gold and silver since its discovery in 1859. This great mine is now apparently near exhaustion. The capital is Carson City. N. was a part of the territory acquired from Mexico 1848, then of Utah, was set off as a separate Territory 1861, and in 1864 was admitted as a State. The discovery of silver 1858–59 brought in settlers in large numbers, especially from Cal. Pop., 1890, 45,761. (See Map, page 134.)

**Nevada,** EMMA WIXOM, b. 1861. American singer, known in opera in England since 1880, and at home from 1884.

**Neversink Highlands.** In New Jersey, extending from Sandy Hook to Raritan Bay, the highest 282 ft. above the sea. They are important landmarks to ships approaching New York. Here are the two Highland Lights, 100 ft. apart.

**Neville's Cross.** In Durham; scene of a victory of an English army under Archbishop York, Oct. 17, 1346, over King David Bruce, 1324–71, who was taken prisoner and 15,000 Scots slain.



Battle of Neville's Cross.

**Nevin,** ETHELBERT, b. 1862. American composer of songs and salon pieces for the pianoforte.

**Nevin,** JOHN WILLIAMSON, D.D., 1803–1886. Prof. at Allegany, Pa., 1829–40; pres. Marshall Coll. 1841–53, and of Franklin and Marshall Coll. 1866–76; chief founder of the MERCERSBURG THEOLOGY (q.v.).—His cousins, EDWIN HENRY, D.D., b. 1814, and ALFRED, D.D., 1816–1890, pub. many religious books.

**Nevins,** JOHN LIVINGSTON, D.D., 1829–1893. American missionary in China from 1853; writer of Chinese books.

**New Albany.** Capital of Floyd co., Ind., on the Ohio opposite Louisville, Ky. It has considerable manufactures. Pop., 1890, 21,059.

**New Amsterdam.** Name borne by New York City 1647–64.

**Newark.** City of Essex co., N. J., on the Passaic, 9 m. w. of New York; founded 1666. It has ample railroad communications and extensive manufactures, particularly of leather, jewelry, iron and steel, celluloid goods, drugs and chemicals. Pop., 1890, 181,830.

**Newark.** Capital of Licking co., Ohio, on Licking River. Pop., 1890, 14,270.

**Newark System.** In Geology, group of rocks of Mesozoic age, red in color and of a high dip, occurring near the Atlantic coast from Nova Scotia to the Carolinas. The system is often spoken of as a sandstone.

**New Bedford.** City of Bristol co., Mass., on Buzzard's Bay, at the mouth of the Acushnet River. It was formerly one of the leading ports of the whale fishery, and, though this has greatly declined, is still prominent with general fisheries and commerce. It is the third cotton manufacturing place in U. S., having 854,500 spindles and 12,471 looms in 1890. It was incorporated in 1787 and chartered in 1847. Pop., 1890, 40,733.

**Newbern.** Capital of Craven co., N. C., and of the Province and State till 1793; at junction of the Neuse and Trent; founded by Swiss 1710; taken by Gen. Burnside March 14, 1862. Pop., 1890, 7,843.

**Newberry,** JOHN STRONG, 1822–1892. Geologist of Lt. Williamson's expedition, 1855, to explore the country between San Francisco and the Columbia; with Lt. Ives on the Colorado 1857; sec. Western dept. U. S. Sanitary Commission 1861; prof. Columbia Coll. from 1866; State Geologist of Ohio 1869: author of 6 vols. of Reports, several works on the Paleobotany of N. America, and a monograph on Paleozoic fishes.

**Newbery,** JOHN, 1713–1767. London publisher and writer of children's books, praised by Goldsmith.

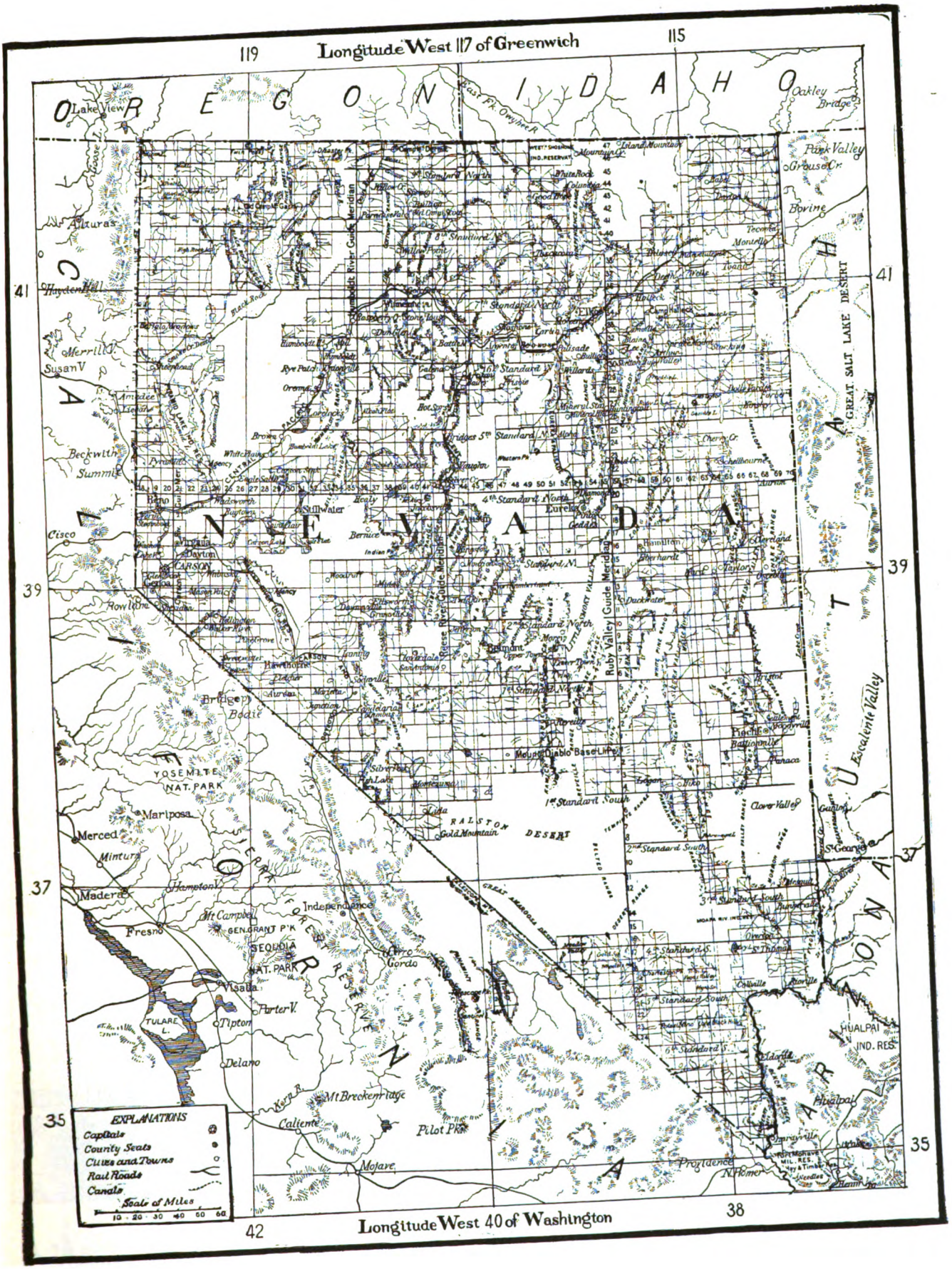
**New Brighton.** Village of Staten Is., 6 m. s.w. of New York. Pop., 1890, 16,423.

**New Britain,** or NEU POMMERN. Largest island of the Bismarck Archipelago, n.e. of New Zealand; under a German protectorate; area 9,600 sq. m., pop. ab. 100,000.

**New Britain.** City of Hartford co., Conn., organized 1850. Pop., 1890, 19,007.

**New Brunswick.** Province of e. Canada. Its area is 28,110 sq. m. The surface is generally undulating, rising in the n.w. to hills of considerable elevation. The coast is broken and rocky. Of its industries the cutting and manufacture of lumber hold the first rank. Its fisheries are of great importance, while agriculture and the raising of stock are subordinate. It was settled by the French 1604, and with Nova Scotia formed the province of Acadia until 1713, when they passed to England. They were separated 1785, and remained independent provinces until 1867, when they were united with Ontario and

The Green at Fredericton.


Longitude West 117 of Greenwich
Longitude West 40 of Washington
OREGON
IDAHO
NEVADA
CALIFORNIA
UTAH
ARIZONA
GREAT SALT LAKE DESERT
RALSTON DESERT
Escalante Valley
Mount Diablo Base Line
Humboldt River Guide Meridian
Ruby Valley Guide Meridian
Lake View
Oakley
Park Valley
Bovine
Alturas
Hayden Hill
Merrill
Susan V
Amedee
Beckwith Summit
Cisco
Bridgeport
Bodie
YOSEMITE NAT. PARK
Mariposa
Merced
Mintura
Madera
Hampton
Fresno
Mt Campbell
GEN. GRANT P'K
SEQUOIA NAT. PARK
Visalia
Porter V.
Tipton
TULARE L.
Delano
Kern R.
Caliente
Mt Breckenridge
Pilot Pk
Mojare
Independence
Cerro Gordo
Gold Mountain
Providence
N. Homer
Hualpai
HUALPAI IND. RES.
Kingman
St George
Clover Valley
Pioche
Panaca
Eureka
Austin
Carson
Reno
Dayton
Stillwater
Yerington
Hawthorne
Silver Peak
Lida
Tonopah
Beatty
Bishop
Owens R.
Mono L.
Walker L.
Pyramid L.
Winnemucca
Elko
Wells
Ely
Pioneer
Tuscarora
Gerlach
Lovelock
Fallon
Battle Mtn
Carlin
Wendover
Oreana
Rye Patch
Humboldt L.
Black Rock
Buffalo Mountains
Sheep Mts
Pilot Mts
Gravelly Range
Desert Range
Pahranagat Range
Meadow Valley Range
Pahroc Range
Delamar Range
Schell Creek Range
Egan Range
Ruby Mts
Toiyabe Range
Shoshone Range
Toquima Range
Monitor Range
Antelope Range
Fish Lake Range
Sierra Nevada
Wassuk Range
Pilot Range
Cherry Cr.
Chalkbourne
Aurora
Hamilton
Berkeley
Taylor
Ophir
Duckwater
Ione
Austin
Bristol
Caliente
Moapa
Overton
St Thomas
Bullfrog
Rhyolite
Ivanpah
Mojave R.
Colorado R.
Virgin R.
Muddy R.
Meadow Valley Wash
Humboldt River
Carson R.
Walker R.
Owyhee R.
East Fk. Owyhee R.
Bruneau R.
Salmon Falls Cr.
Bear R.
Snake R.
Lake Tahoe
Pyramid L.
Walker L.
Mono L.
Tulare L.
Sierra Nevada
Wasatch Range
Uinta Mts
Wind River Range
Bighorn Mts
Black Hills
Rocky Mts
Cascade Range
Sierra Madre
Wind River Mts
Bighorn R.
Yellowstone R.
Missouri R.
Platte R.
Arkansas R.
Rio Grande
Pecos R.
Colorado R.
Green R.
Snake R.
Columbia R.
Pacific Ocean
Gulf of California
Gulf of Mexico
Atlantic Ocean
Hudson Bay
Great Slave L.
Great Bear L.
Great Lakes
Mexico
Cuba
Bahamas
Greenland
Iceland
Europe
Asia
Africa
Australia
Pacific Ocean
Atlantic Ocean
Indian Ocean
Arctic Ocean
Antarctic Ocean
EXPLANATIONS
Capitals
County Seats
Cities and Towns
Rail Roads
Canals
Scale of Miles
10 20 30 40 50 60
119
115
41
39
37
35
42
38

Quebec to form the Dominion of Canada. Capital, Fredericton. Pop., 1891, 321,263, largely descendants of New England loyalists, who migrated 1783.

**New Brunswick.** Capital of Middlesex co., N. J., on the Raritan, 32 m. w. of New York, founded 1681; site of Rutgers College. Pop., 1890, 18,603.

**New Brunswick (N. J.) Theological Seminary.** Founded 1784 by the Reformed (Dutch) Church. It has 5 professors, ab. 23 students, and a library of 37,000 vols.

**Newburg.** City of Orange co., N. Y., on the Hudson, 60 m. n. of New York. Here Washington was stationed, and disbanded the army June 1783. Pop., 1890, 23,087.

**Newbury.** Town of Berkshire, Eng., near which were fought two severe but indecisive battles with Charles I. Essex commanded the forces of parliament in the first, Sept. 20, 1643; Manchester and Waller in the second, Oct. 27, 1644. Pop., 1891, 11,000.

**Newburyport.** City of Essex co., Mass., on the Merrimack near the coast; incorporated 1764, chartered 1851. Pop., 1890, 13,947.

**New Caledonia.** Island of the s. Pacific, ab. 800 m. n.n.e. of New Zealand; discovered 1774; held by France since 1853, and used as a convict station. Area ab. 6,500 sq. m.; pop., 1890, with dependent islands, 62,752.

**New Castle.** Capital of Lawrence co., Pa., on the Shenango, 52 m. n.n.w. of Pittsburg. It has extensive iron manufactures. Pop., 1890, 11,581.

**Newcastle.** Seaport of New S. Wales, 80 m. n.e. of Sydney; important for its exportations of coal, grain, and wool. Pop., 1891, 24,600.

**Newcastle,** THOMAS PELHAM HOLLES, DUKE OF, 1693–1768. Sec. of State 1724–54; Prime Minister 1754–56 and 1757–62.

**Newcastle-upon-Tyne.** City of Northumberland, on the Tyne, 10 m. from its mouth, 117 m. s.e. of Edinburgh; besieged and taken by the Scotch 1644. It has a large commerce, especially in coal, and has extensive iron manufactures. Pop., 1893, 196,997.

**New Church.** See NEW JERUSALEM CHURCH.

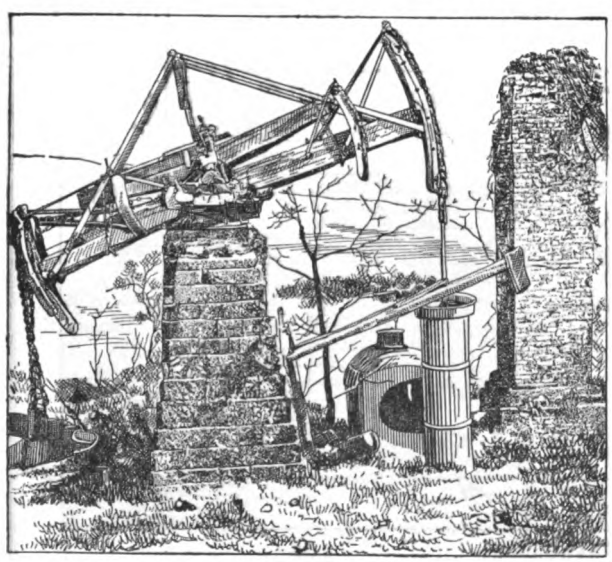
**New-chwang,** or NIU-CHWANG. Port of Manchuria, China, on the Liao. It has a large trade. Pop. ab. 60,000.

**Newcomb,** SIMON, b. 1835. Prof. of Astronomy at U. S. Naval Observatory 1861; superintendent of Nautical Almanac since 1878; Prof. of Mathematics at Johns Hopkins Univ. 1884–93; author of many important books and memoirs, among which are tables of Uranus and Neptune. *Popular Astronomy*, 1877, and a series of mathematical text-books.

**Newcome,** WILLIAM, D.D., 1729–1800. Bp. of Dromore 1766, Abp. of Armagh 1795. *Harmony of the Gospels*, 1778; *Biblical Translations*, 1792.

**Newcomen,** THOMAS, 1663–1729. English blacksmith, who patented a steam-engine 1705.

**Newcomen Engine.** Form of pumping engine developed between 1705 and the time of James Watt, 1765. It consisted of a spherical boiler surmounted by a single-acting cylinder. Steam, being admitted through the cock in the pipe between boiler and cylinder, lifted the piston, which allowed the weight of the pump-rods at the outer end of a beam to descend and lift the water column in the mine. The beam was of wood, with segments of a circle at each end; the piston-rod and pump-rod were hung by chains to these segments to secure parallel motion. When the piston rose to the top of the cylinder, cold water was injected into the steam below the piston, and the atmosphere, acting upon the piston through the open-topped cylinder, forced the piston down and the pump-rods up. The valves for steam and water of the early engine were operated by hand. Humphry Potter, employed for this purpose, first made the engine operate them itself. Watt's first great improvement on this engine was to effect the condensation outside the cylinder in a separate vessel. See ENGINE, HISTORY OF.



Newcomen Engine.

**New Connecticut.** Original name, 1777–78, of Vermont. During the struggle between N. Y. and N. H. for the Vt. territory, many grants of Vt. lands were issued by the Gov. of N. H. to residents in Conn. The family names and town names of Conn. reappear in Vt., and some of the Vt. towns formed under the N. H. grants held their first town meetings in Conn. before the removal of their settlers.

**Newdigate,** SIR ROGER, 1719–1806. M.P. and antiquarian, founder of the annual prize at Oxford for a poem.

**Newel.** The cylindrical core of a winding staircase.

**Newell,** ROBERT HENRY ("ORPHEUS C. KERR"), b. 1836. American humorist.

**Newell,** SAMUEL, 1785–1821. American missionary in India. His *Conversion of the World* (with G. Hall), 1818, and memoir of his wife, HARRIET ATWOOD, 1793–1812, were widely read.

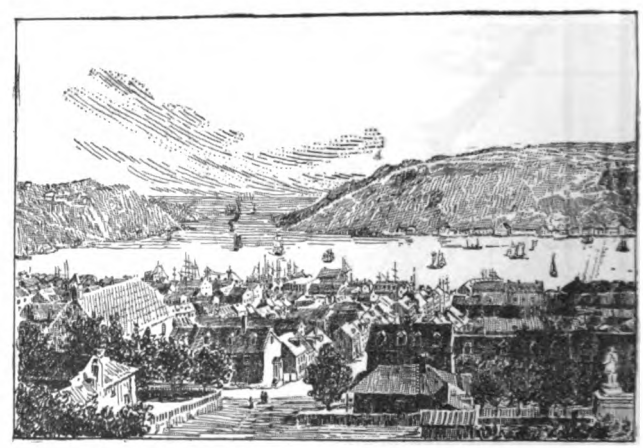
**Newell,** WILLIAM AUGUSTUS, b. 1819. M.C. 1847–51 and 1865–67; Gov. of N. J. 1856–60; Gov. of Washington 1880–84.

**Newel Post.** Pillar in stone or wood, at the foot of a staircase, against which the railing terminates. It often becomes the pedestal of a statue or other ornamental finial.

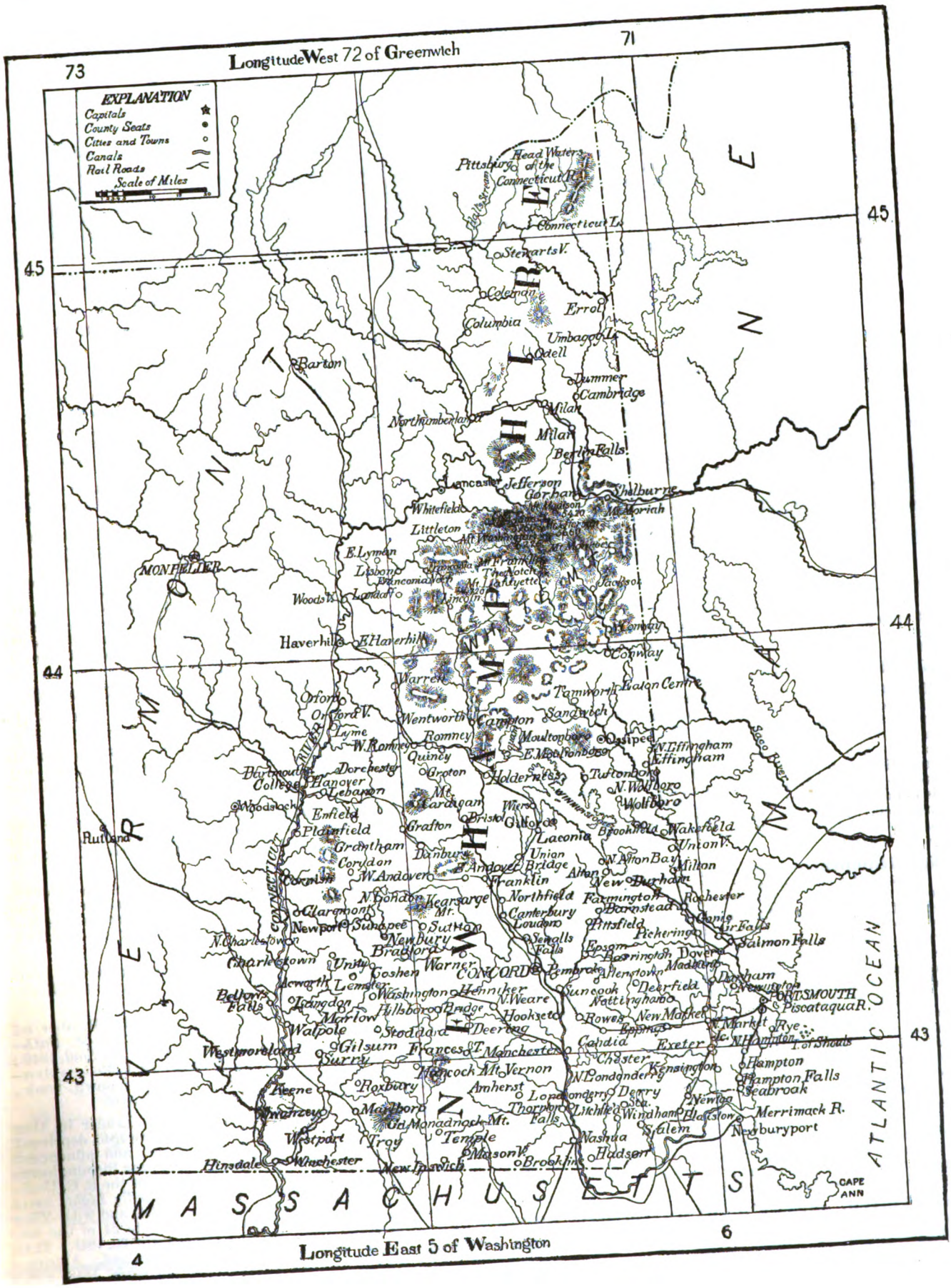
**New England.** Six n.e. States; first called North Virginia; named New England by Capt. John Smith, who made a map of the coast 1614. In 1620 King James incorporated a council for the planting, ordering, and governing New England, with unbounded powers of legislation and government over a territory extending 40°–48° N., and from Atlantic to Pacific. The colonies obtained their grants of land from this corporation, and these were confirmed by the crown. The first white settlers were English. A confederation of colonies was formed in 1643, including Mass., Plymouth, New Haven, and Conn., and lasted till 1660, when 12 privy councilors were appointed. The town was the political unit; all local affairs were transacted in town-meeting. The colonial government dealt with general interests. The governors were elected by the people till Sir Edmund Andros arrived as Gov. 1686.

**New Forest.** Hunting ground created by William the Conqueror, by demolishing villages along the coast of Hampshire from the Avon to Southampton Water. Here his son Rufus was killed. It still exists, and contains 66,000 acres.

**Newfoundland.** Island between the Gulf of St. Lawrence and the Atlantic; area ab. 42,000 sq. m. Its shores are very broken and rocky; the interior is hilly. Much of it is open, dotted with many lakes. Its mean temperature is low, but its insular situation prevents extremes of temperature. The principal industry is its fisheries, in which more than one-fourth of its inhabitants are engaged. Cattle and sheep are



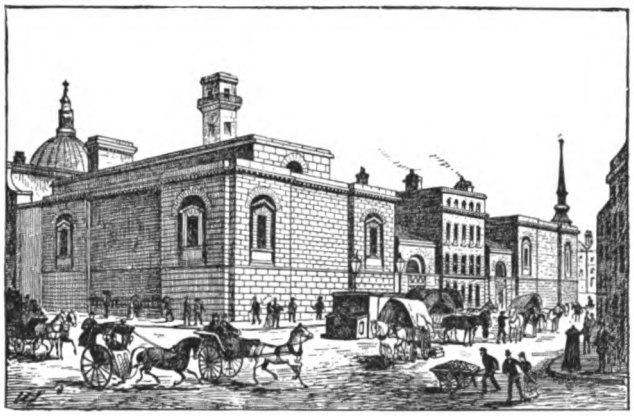
General View of St. John's, Newfoundland.


Longitude West 72 of Greenwich
73
71
EXPLANATION
Capitals
County Seats
Cities and Towns
Canals
Rail Roads
Scale of Miles
45
44
43
Pittsburg
Head Waters of the Connecticut R.
Connecticut L.
Stewartsv.
Coleman
Errol
Columbia
Umbagog L.
Odell
Barton
Dummer
Cambridge
Milan
Northumberland
Berlin Falls
Lancaster
Jefferson
Gorham
Shelburne
Whitefield
Mt. Madison
Mt. Moriah
Littleton
Mt. Washington
Mt. Monroe
E. Lyman
Lisbon
Franconia
Mt. Franklin
The Notch
Mt. Lafayette
Jackson
MONPELIER
Woodsv.
Landaff
Lincoln
Conway
Haverhill
E. Haverhill
Warren
Tamworth
Eaton Centre
Orford
Orford V.
Wentworth
Campton
Sandwich
Lyme
Romney
Moultonboro
Ossipee
W. Romney
Quincy
E. Moultonboro
N. Effingham
Effingham
Saco River
Dartmouth College
Dorchester
Groton
Holderness
Tuftonboro
Hanover
Lebanon
Mt. Cardigan
Wiers
N. Wolfboro
Woodstock
Enfield
Bristol
Gilford
Wolfboro
Plainfield
Grafton
Laconia
Brookfield
Wakefield
Rutland
Grantham
Danbury
Union
Union V.
Corydon
W. Andover
E. Andover
Bridge
N. Alton Bay
Milton
Cornish
Franklin
Alton
New Durham
N. London
Hearsarge Mt.
Northfield
Farmington
Rochester
Claremont
Canterbury
Barnstead
Newport
Sunapee
Sutton
Loudon
Pittsfield
Gonic
Gr. Falls
N. Charlestown
Newbury
Senalls Falls
Pickering
Salmon Falls
Bradford
Epsom
Barrington
Dover
Charlestown
Unity
Warner
CONCORD
Pembroke
Allenstown
Madbury
Goshen
Lewisth
Lempster
Hennicker
Sunnook
Deerfield
Durham
Newmarket
Bellows Falls
Washington
N. Weare
Nottingham
PORTSMOUTH
Langdon
Hillsboro Bridge
Hooksett
Rowes
New Market
Piscataqua R.
Marlow
Walpole
Stoddard
Deering
Epping
N. Market
Rye
Gilsum
Frances T.
Candia
Exeter
N. Hampton
Westmoreland
Surry
Manchester
Chester
Hampton
Hancock
Mt. Vernon
N. Londonderry
Kensington
Hampton Falls
Keene
Roxbury
Amherst
Londonderry
Derry
Seabrook
Marlborough
Thornton Falls
Litchfield
Windham
Newton
Haverhill
Merrimack R.
Gd. Monadnock Mt.
Salem
Newburyport
Westport
Troy
Temple
Nashua
Hudson
Hinsdale
Winchester
New Ipswich
Mason V.
Brookline
CAPE ANN
ATLANTIC OCEAN
MASSACHUSETTS
Longitude East 5 of Washington
4
6

raised. Coal, ores of copper, lead and silver and asbestos are mined. It was probably visited by Lief, the Norse discoverer, ab. 1000, and by the Cabots 1497. The cod fisheries sprang up early; Portuguese, Spanish, French, and English engaged in them. The French established colonies 1629; conflicts ensued between France and England. The island was ceded to Gt. Britain 1713, the French reserving merely the right to fish off its coasts. It is not part of the Dominion of Canada. Scarcity of provisions caused great distress 1895–96. Capital, St. John's; pop., 1891, 202,145.

**Newfoundland Dog.** Supposed to have been introduced by the Norsemen into America. It is a water dog, with partly webbed feet, color black and white, hair curly, tail bushy and turned up at the end. In spirit it is courageous; its eyes are gentle, its face noble. The largest are 30 in. high at the shoulder.

**Newgate.** Prison on Newgate St., London, known as existing 1207. It stood by the then "new gate" of the city; was rebuilt ab. 1420, again after the great fire of 1666, and once more



Newgate.

in 1780, but seriously damaged in the riots of that year, when 300 prisoners were set free by the mob. Debtors were not sent to it after 1815: it has been little used since 1877. The *Newgate Calendar* gives sketches of notorious criminals who have been confined here.

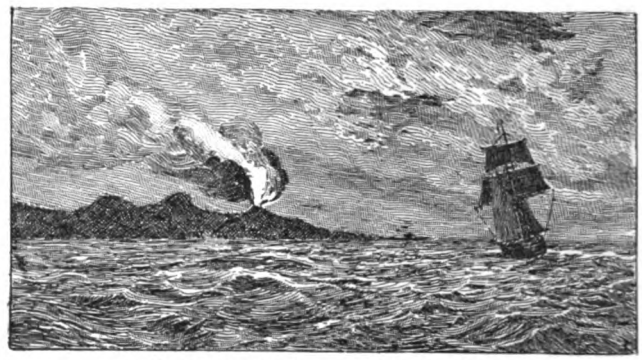
**New Granada.** See COLOMBIA.

**New Guinea,** or PAPUA. Island n. of Australia and just s. of the equator, between the Indian and Pacific oceans. Its shape is irregular, its length e. to w. ab. 1,500 m., maximum breadth 400 m., and area ab. 320,000 sq. m. Its surface is mountainous in the interior, the ranges extending to the e. and w. extremities, with peaks from 10,000 to 13,200 ft. high. The s. shore, opposite Australia, is low, marshy, and densely forested. It is nominally held by the Dutch, Germans, and British, but is imperfectly known and developed. Its inhabitants are Papuans with admixture of Polynesian and Malayan elements. Pop. ab. 500,000.

**New Hampshire.** One of the n.e. States; area 9,305 sq. m. It has but a small extent of seacoast. The surface is hilly, rising toward the n. in the White Mts., the highest peak of which, Mt. Washington, has an altitude of 6,293 ft. The principal stream is the Connecticut, upon its w. border. Forests have been cleared away wherever settlement has progressed. The surface geology of the State is very simple, it being covered almost entirely by Archæan formations, a small area of Cambrian being found in the s.e., while near the Connecticut is a narrow belt of Silurian. Its industries are agricultural and manufacturing, the latter rapidly increasing, the former diminishing with the increasing density of population. New Hampshire was early settled by immigrants from Mass. It was one of the 13 original States of the Union. Its coast line was explored by Capt. John Smith 1614: settlements were made at Dover and Portsmouth 1623. The province was united with Mass. 1641, was made a separate royal province 1679, and again united with Mass. 1685–92. It took an active part in the Revolution, joined the federal Union 1788, and during the Civil War sent nearly a tenth of its entire population to join the Union forces. Concord was made the permanent capital 1807. Pop., 1890, 376,530. (See Map, page 136.)

**New Haven.** Capital of N. H. co., Conn., and the largest city of the State; on Long Island Sound; settled 1738 as a separate colony; united to Conn. 1662; chartered 1784. It is the site of Yale Univ., and has extensive commerce and manufactures. Pop., 1890, 81,298.

**New Hebrides.** Group of volcanic islands e. of Australia, discovered 1606, explored 1773; nominally held by British and French. Most of the islanders are heathens, cannibals, and ancestor-worshipers; they are honest and truthful, but suspi-



Natural Lighthouse on Island of Tanna.

cious and revengeful; they are of Papuan descent. Area 5,100 sq. m., pop. ab. 80,000.

**New Jersey.** One of the e. States: area 8,224 sq. m. Its n. part is broken, being intersected by numerous ridges; the s. part is a plain, sloping gently to the Atlantic. The shore is bordered almost continuously by reefs inclosing large bays or swamps. Its rivers are short, and navigable to but a short distance, except the Hudson on the e. border and the Delaware on the w., the latter being navigable as far as Trenton. In the n. hilly portions of the State are areas of Archæan, Cambrian and Silurian rocks, succeeded s. by Triassic sandstones, and in the plains by Cretaceous and Eocene beds, with Quarternary deposits along the seacoast. The industries of the State consist of extensive and varied manufactures, transportation, and agriculture, especially market-gardening in the vicinity of New York and Phila. N. J. was first settled by the Dutch. When the Duke of York was granted the colony 1664, he made it over to Lord Berkeley and Sir Geo. Carteret. In 1702 the proprietary rights were ceded to the crown, and a joint governor of N. Y. and N. J. was appointed. The important battles of Trenton, Princeton, and Monmouth were fought in N. J. during the Revolution. Capital Trenton. Pop., 1890, 1,444,933. (See Map, page 138.)

**New Jersey,** COLLEGE OF. See PRINCETON UNIVERSITY.

**New Jersey Tea.** *Ceanothus americana.* Shrub of the natural family *Rhamnaceæ*, native of e. N. America.

**New Jerusalem Church.** Organized 1787 by adherents of SWEDENBORG (q.v.), who regard it as the perfect and ultimate state of the Church prophesied in the Apocalypse. It has ab. 10,000 members in England and America.

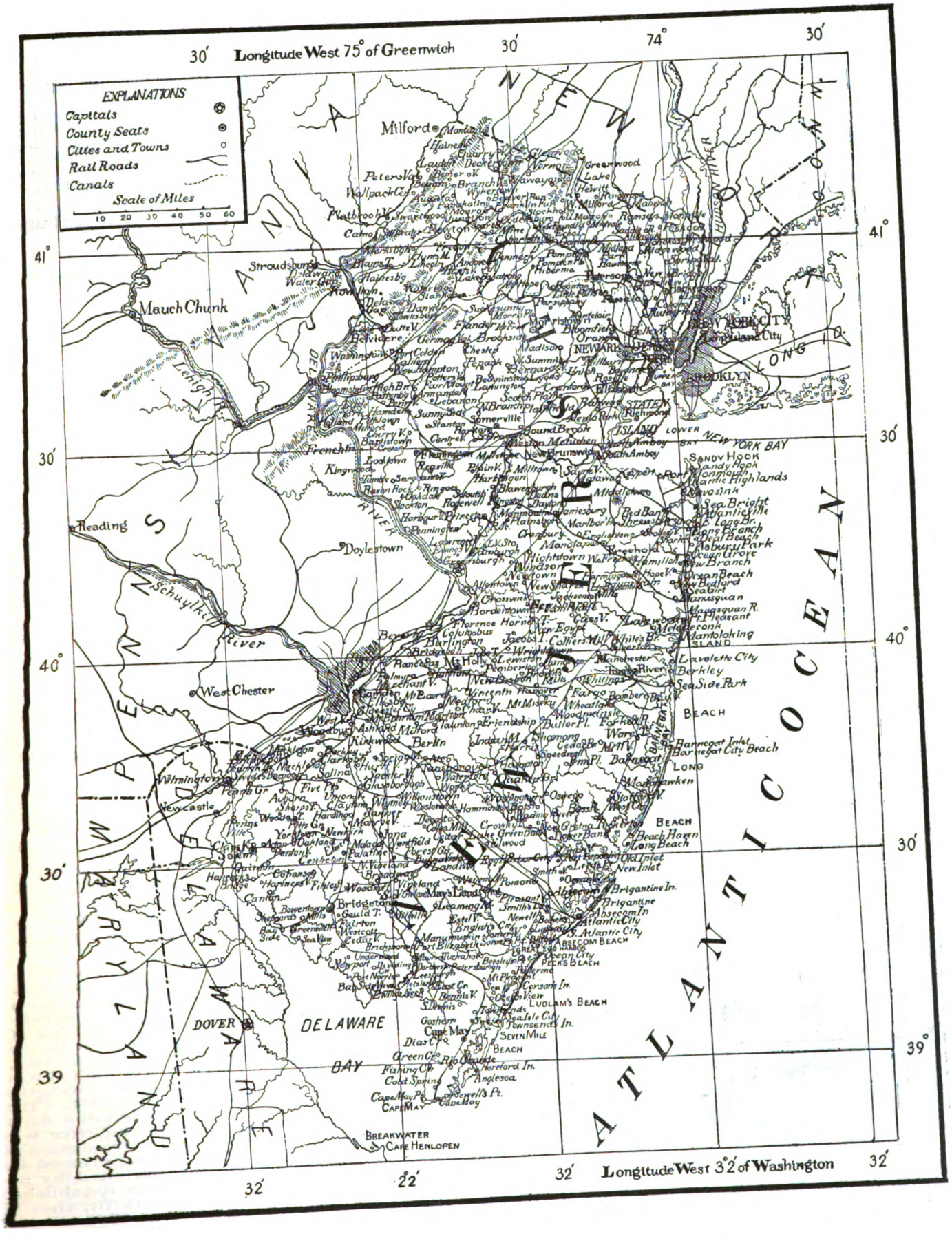
**New Light** AND **Old Light.** Names given to the two branches of the Associate Synods of Scotland in 1800, and later to the two parties in the Reformed Presbyterian Church in America.

**New London.** City of N. L. co., Conn., on the Thames, near Long Island Sound. Its harbor is excellent, and it was once prominent in the whale fishery. It was settled as Nameaug 1646, burned by British troops 1781, and chartered 1784. Pop., 1890, 13,757.

**Newman,** EDWARD, 1801–1876. English naturalist, ed. *Entomologist*, 1840, and other periodicals. *Ferns*, 1840; *Birds*, 1866; *Moths*, 1869; *Butterflies*, 1871.

**Newman,** FRANCIS WILLIAM, LL.D., b. 1805. Brother of the Cardinal; Latin prof. Univ. Coll. of London 1846–63. *Catholic Union*, 1844; *Hist. Hebrew Monarchy*, 1847; *The Soul*, 1849; *Theism*, 1858; *Miscellanies*, 3 vols., 1869–89; *Dict. Modern Arabic*, 1871; *Libyan Vocabulary*, 1882. His best-known book, *Phases of Faith*, 1850, is autobiographic and deistic.

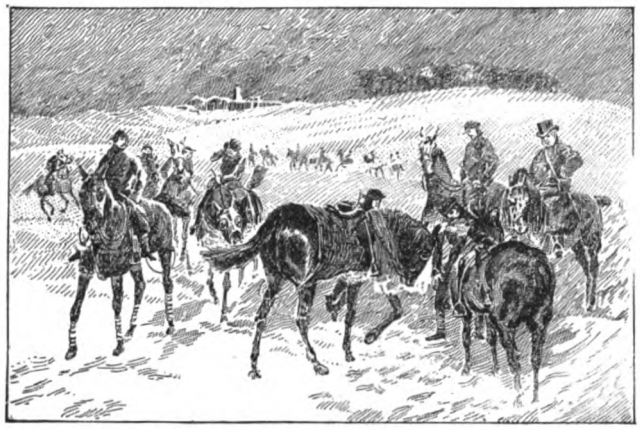
**Newman,** JOHN HENRY, D.D., 1801–1890. Leader in the Oxford movement, whose submission to Rome 1845 deprived the Ch. of England of one of her greatest men and influenced many minor secessions; head of the Oratory near Birmingham from 1849, except 1854–58, when he was rector of the R. C. University at Dublin; Cardinal 1879. *Lead, Kindly Light*, and other lyrics appeared in *Lyra Apostolica*, 1836, and with *The Dream of Gerontius* in *Verses*, 1867. He wrote 24 of the 90 *Tracts for the Times*, including the famous No. 90, 1841. His sermons, collected in 8 vols., are very highly valued. Among his other works are two novels, *Loss and Gain*, 1848, and *Callista*, 1855; *Arians of 4th Century*, 1833; *Development of Christian Doctrine*, 1845; *Difficulties of Anglicans*, 1850; *Apologia pro Vita sua*, 1864; *Grammar of Assent*, 1870; *Letters*, 1891.


Longitude West 75° of Greenwich
Longitude West 32° of Washington
EXPLANATIONS
Capitals
County Seats
Cities and Towns
Rail Roads
Canals
Scale of Miles
10 20 30 40 50 60
Milford
Stroudsburg
Mauch Chunk
Reading
Doylestown
West Chester
Wilmington
Newcastle
DOVER
DELAWARE
BAY
Cape May
Cape May Pt.
Cape May
Breakwater
Cape Henlopen
Sea Bright
Long Branch
Asbury Park
Ocean Grove
Ocean Beach
Manasquan
Mantoloking
Lavallette City
Berkley
Sea Side Park
Barnegat Inlet
Barnegat City Beach
Long Beach
Beach Haven
Brigantine In.
Atlantic City
S. Atlantic City
Absecom Beach
Ocean City
Peck's Beach
Ludlam's Beach
Seven Mile Beach
Townsends In.
Hereford In.
Anglesea
Bewell's Pt.
Sandy Hook
Navesink
Atlantic Highlands
Keyport
Port Monmouth
Bedford
Sea Girt
Pt. Pleasant
Metedeconk
Bordentown
Burlington
Bridgeton
Millville
Vineland
Salem
Woodbury
Camden
Mt. Holly
Trenton
Princeton
Lambertville
Phillipsburg
Easton
Bethlehem
Allentown
Pottsville
Hackensack
Paterson
Newark
Elizabeth
Jersey City
Brooklyn
Staten Island
Long Island
Sandy Hook
Lower New York Bay
Delaware River
Lehigh River
Schuylkill River
Hudson River
Raritan River
Passaic River
Delaware Water Gap
Atlantic Ocean
Pennsylvania
New York
Delaware
Maryland

**Newman,** JOHN PHILIP, D.D., LL.D., b. 1826. Chaplain U. S. Senate 1869–74, Inspector of U. S. Consulates 1874, M. E. Bp. 1888. *Dan to Beersheba*, 1864; *Babylon and Nineveh*, 1875; *America for Americans*, 1887.

**Newman,** SAMUEL PHILLIPS, 1796–1842. Prof. Bowdoin 1820–39. *Rhetoric*, 1829; *Political Economy*, 1835.

**Newmarket.** Town in Suffolk and Cambridgeshire, Eng.,



A Wintry Morning on Newmarket Heath.

14 m. e.n.e. of Cambridge; noted since 1605 for its races, of which seven occur annually. Pop., 1891, 6,213.

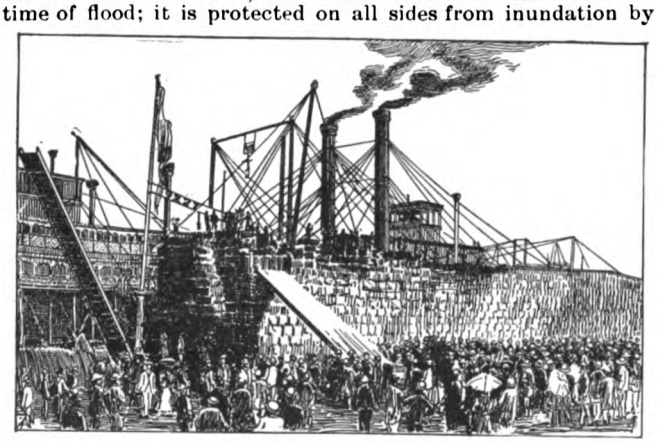
**Newmarket.** Village of Shenandoah co., Va., scene of a repulse of Union troops under Sigel May 15, 1864.

**New Mexico.** S.w. Territory of the U. S. Area 122,580 sq.m. The e. part consists of arid plains, undulating in surface, with an e. slope. The s.w. part is mainly an arid plateau, broken by occasional ridges and groups of mountains. In the n.w. part are high mountain ranges, many of the peaks exceeding 13,000 ft. The industries consist mainly in the raising of sheep and mining. Coal is mined to a large extent in the n. part, and the precious metals at various points in the central and w. portions. It was a part of Mexico till ceded to the U.S. 1848, with Cal. and other regions. It was organized as a Territory 1850. Its growth has been stimulated by the construction of railroads. Capital, Santa Fé. Pop., 1890, 153,593, mostly of Spanish-Mexican descent. (See Map, page 140.)

**New Netherlands.** Name given by the Dutch to their discoveries and settlements around New York 1614–64.

**Newnham College.** Founded 1871–75 at Cambridge, Eng., for the higher education of women; incorporated 1880. Its students were admitted 1881 to the university examinations, at which many of them have taken high rank. It has 10 instructors and ab. 150 students.

**New Orleans.** In Orleans parish, La.; principal city and commercial port of the Gulf States, on the Mississippi, 107 m. from the Gulf. The site is very flat, but slightly above the mean level of the river, and several feet below its surface in time of flood; it is protected on all sides from inundation by



A New Orleans Cotton Wharf.

means of levees. The mouth of the river is a delta, with several channels, all of which were formerly much obstructed by bars. In 1874 the construction of jetties for the improvement of South Pass, one of these channels, was commenced and carried through successfully, obtaining a depth of 34 ft. on the bar and thus immeasurably increasing the usefulness of the river to commerce. The city has now a very extensive sea and river trade, and with its railroads has communication in all directions. It is irregularly planned, and is supplied with water by pumping from the Mississippi. It has no sewers, and the accumulations of water, etc., after flowing through the gutters and canals, are carried into the bayous beyond the city by a sort of undershot wheels. It is an unhealthy city; apart from its not infrequent epidemics of yellow fever, the death-rate is double that of northern cities. It was founded by the French under Bienville in 1718. After passing to Spain and back to France, it was acquired with the Province of Louisiana by the U. S. 1803. It was the scene of Jackson's crushing defeat of the British under Packenham, Jan. 8, 1815, and in the Civil War it was taken by Farragut, April 25, 1862. Pop., 1890, 242,039.

**New Philippines.** Name given to the CAROLINE ISLANDS (q.v.).

**New Pomerania.** See NEW BRITAIN.

**Newport.** Town of Monmouthshire, Eng., on the Usk, 4 m. from its mouth; noted for exports of coal and iron. Pop., 1891, 54,695.

**Newport.** City of Campbell co., Ky., on the Ohio, opposite Cincinnati, of which it is practically a suburb; founded 1791. Pop., 1890, 24,918.

**Newport.** Capital of N. co., R. I.; on an island in Narragansett Bay; settled 1638; long important for its commerce; held by the British 1776–79; chartered 1853; internationally famous as a summer resort of wealth and fashion. Pop., 1890, 19,457.

**Newport News.** Seaport in Warwick co., Va., at the mouth of the James River, 69 m. s.e. of Richmond. It has one of the best harbors in the world and is fast becoming the foremost grain-shipping port in the U.S., ranking fourth in 1893. It has a grain elevator having a capacity of ab. 2,000,000 bushels. Extensive ship-building yards are here. Pop. ab. 5,000.

**New Providence.** One of the BAHAMAS (q.v.).

**New Red Sandstone.** Formation consisting chiefly of sandy and argillaceous strata, for the most part brick-red, but containing portions of a greenish gray; when these occur in spots and stripes the series has sometimes been called Variegated Sandstone. See PERMIAN and TRIASSIC.

**New River.** Main branch of the Kanawha, which it joins near Charleston, W. Va. It rises in n.e. N. C., and flows generally n. through Va. and W. Va., where it is traversed in part by the Chesapeake & Ohio R.R. It is noted for the wild beauty of its scenery.

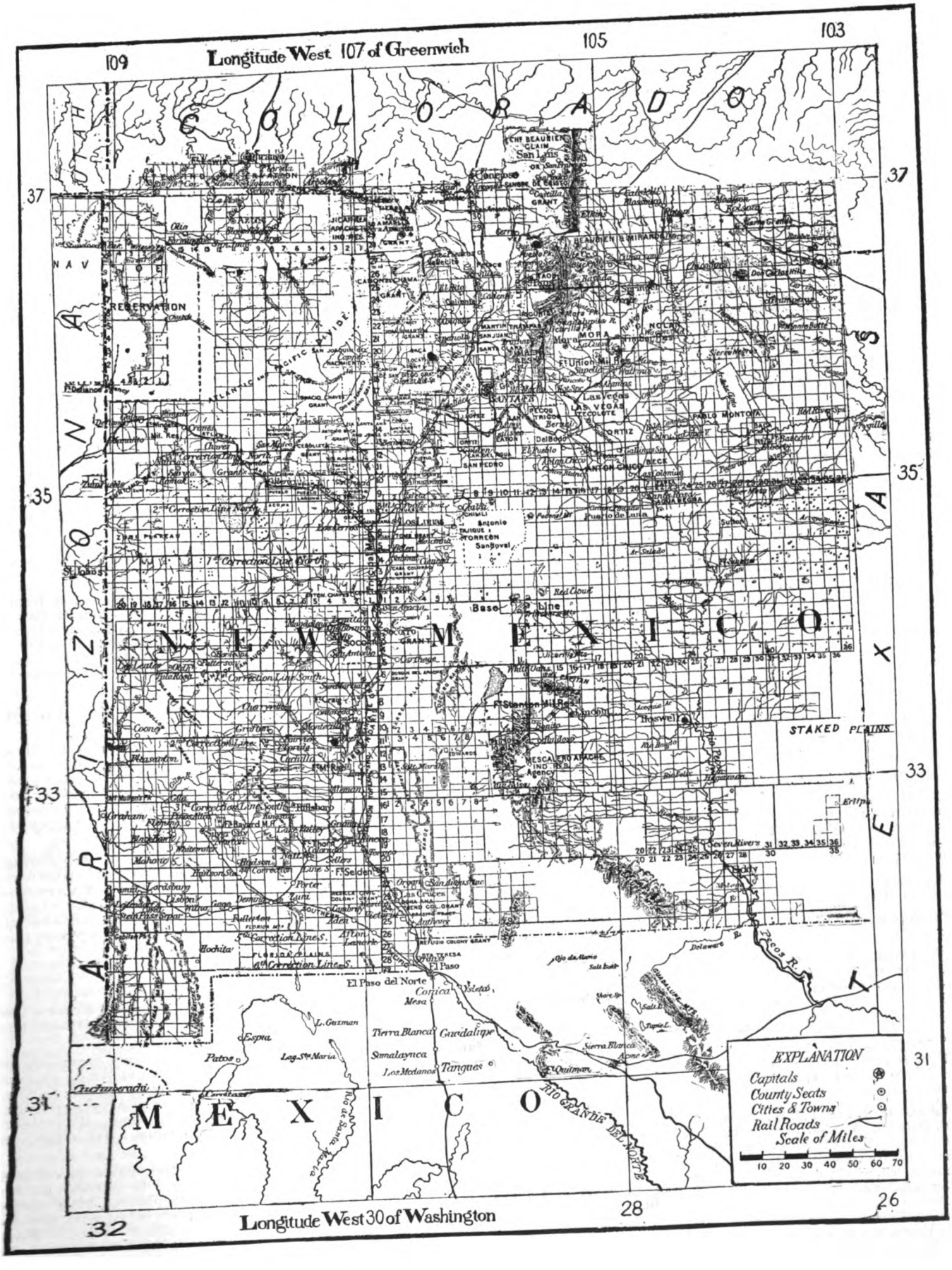
**Newsham,** ALBERT, 1809–1864. American artist, noted for his lithographic portraits.

**New Siberia.** Group of islands in Arctic Ocean, n.e. of Lena delta.

**New South Wales.** British colony in s.e. Australia; founded 1788 as a convict station. The e. part is traversed by a mountain range parallel to the coast, back of which stretch great plains. Its area is 310,700 sq. m. The leading industries are agriculture, cattle-raising, and coal-mining. The capital is Sydney. Pop., 1892, 1,197,650.

**New Spain.** Name first applied by Grijalva to Yucatan 1518; later to the Spanish dominions in N. America, especially Mexico.

**Newspapers.** Journalism, as we know it, began with the weekly Frankfort *Gazette* 1615. But news-sheets, called *acta diurna*, were circulated at Rome under government supervision 59 B.C., and perhaps earlier. News-pamphlets appeared in various cities of Germany between 1498 and 1610. The writing of circular news-letters, examples of which may be seen in the *Paston Letters*, was a recognized calling in England ab. 1625, and did not cease till ab. 1740. The first English periodical was the London *Weekly News*, 1622; the first in France was the *Gazette*, Paris, 1631; the *Mercure* came next, 1672–1853. The first London daily was the *Postboy*, 1695. The London daily *Times* was started 1785. The Boston (Mass.) *News-Letter* was issued from April 24, 1704, to 1776; it attained a circulation of 300 copies. An earlier venture, 1698, had been suppressed by the government. The Boston *Gazette* was "published by authority" 1719–54. The New England *Courant* was established by James Franklin 1721. In 1722 Benjamin Franklin, then 16 years old, became its editor and publisher. From 1729 till 1765 he published the *Pa. Gazette;* the *American Mercury* had begun to appear in Phila. 1719. In 1775 New England had 13 newspapers, Pa. 8, N. Y. 3, the oldest of which, the N. Y. *Gazette*, was begun Oct. 16, 1725. The earliest political paper was


Longitude West 107 of Greenwich
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COLORADO
UTAH
ARIZONA
TEXAS
MEXICO
NEW MEXICO
NAV
RESERVATION
STAKED PLAINS
Las Vegas
Roswell
El Paso
El Paso del Norte
Tierra Blanca
Cuidaline
Tanques
Patos
Espa
Ft Union Mil Res
Ft Stanton Mil Res
Ft Bayard M.R.
Ft Seldon
Ft Selden
Ft Cummings
Ft Quitman
Seven Rivers
Pecos R.
Rio Grande del Norte
EXPLANATION
Capitals
County Seats
Cities & Towns
Rail Roads
Scale of Miles
10 20 30 40 50 60 70
Longitude West 30 of Washington

the N. Y. *Weekly Journal*, 1733. The first daily in America was the *Advertiser* of Phila., 1784; it was the first also to employ reporters. The first N. Y. daily, the *Journal and Register*, was started 1788; the daily *Sun* (the first one cent paper) 1833; the *Herald* 1835; the *Tribune* 1841; the *Times* 1851; the *World* 1860. In 1896 the U. S. and Canada had 20,630 periodicals, of which Canada had 865; of these 2,205 were dailies, 14,640 weeklies, and the rest at longer intervals. In 1893 Gt. Britain had 2,268 newspapers and 1,961 magazines. The total for the world, as estimated in 1896, was 50,000: U. S. and Canada 20,630; Gt. Britain 8,000; Germany 6,000; France 4,300; Japan 2,000; Italy 1,500; Austria-Hungary 1,200; Asia, except Japan, 1,000; Spain 850; Russia 800; Australia 800; Greece 600; Switzerland 450; Holland 300; Belgium 300; all others 1,000; more than half in English language. In England a stamp duty, varying from 1*d.* to 4*d.*, was laid on papers 1711–1855, and continued for postal purposes till 1870.

**Newstead Abbey.** Ten m. n. of Nottingham; founded 1170; held by the Byron family 1540–1818, when the poet sold it.

Newstead Abbey.—The ancestral home of Lord Byron.

Since 1818, ab. $500,000 has been spent on its restoration. Irving gives a full description in his *Abbotsford and Newstead*, 1835.

**New Style.** See CALENDAR.

**New Sweden.** Delaware; so called by Swedish colonists 1638–55.

**Newt.** See SALAMANDRINA.

**New Testament.** Properly New Covenant; canonical Christian Scriptures, consisting of the 4 Gospels, Acts of Apostles, 13 Epistles of St. Paul, that to the Hebrews, 1 of St. James, 2 of St. John, 1 of St. Jude, and the Revelation or Apocalypse.

**Newton.** City of Middlesex co., Mass., 7 m. w. of Boston, of which it is a suburb. Pop., 1890, 24,379.

**Newton,** ALFRED, b. 1829. Prof. Cambridge; writer on ornithology.

**Newton,** SIR CHARLES THOMAS, LL.D., D.C.L., 1815–1894. Antiquarian, in British Museum 1840–52 and 1861–85; prof. Univ. Coll., London, 1880; discoverer and collector in the Orient.

**Newton,** GILBERT STUART, 1797–1835. American-English portrait painter, R.A. 1831.

**Newton,** HUBERT ANSON, 1830–1896. Prof. of Mathematics at Yale since 1855; most widely known for his researches upon meteors.

**Newton,** ISAAC, F.R.S., 1642–1727. Prof. Cambridge 1669; M.P. 1689–90; Warden of the Mint 1695, and its Master from 1699; knighted 1703; pres. Royal Society from 1703; greatest of mathematicians and natural philosophers. He devised the Binomial Theorem; discovered the Analysis now known as the Differential and Integral Calculus; demonstrated the law of Universal Gravitation; invented a reflecting telescope; discovered the compound character of white light; invented the reflecting sextant, similar in all essentials to the instrument now in use as Hadley's quadrant. His thoughts were directed toward gravity as early as 1666; the story about the apple is told by Voltaire. He wrote much on theology. *Principia*, 1687; *Optics*, 1704; *Universal Arithmetic*, 1707; *Analysis by Sines*, 1711; *Lectiones Optical*, 1729; *Method of Fluxions*, 1736; *Methodus*

Isaac Newton.

*Differentialis*, 1736. He was morbidly averse to publicity, and often refused to allow publication.

**Newton,** JOHN, 1725–1807. Curate of Olney, Bucks, 1764–79, rector in London from 1779; leading Anglican Evangelical; author, with Cooper, of the important *Olney Hymns*, 1779. *Works*, 6 vols., 1816.

**Newton,** JOHN, U.S.A., 1823–1895. Brig.-gen. U. S. Vols. 1861, Major-gen. 1863; distinguished in Va. at Gettysburg, and in the West: improver of navigation at Hell Gate and elsewhere in N. Y. waters; Chief of Engineers 1884; retired 1886; pres. Panama R.R. Co. 1888.

**Newton,** RICHARD, D.D., 1813–1887. Rector in Phila. from 1840; prolific writer, especially for children.—His son, RICHARD HEBER, D.D., b. 1840, rector of All Souls' Ch., N.Y., since 1889, has pub. *Uses of the Bible*, 1883; *Book of the Beginnings*, 1884; *Church and Creed*, 1891.—His brother, WILLIAM WILBERFORCE, b. 1843, rector at Pittsfield, Mass., since 1881, has pub. *Abelard and Heloise*, 1883, and other books, 1885.

**Newton,** THOMAS, D.D., 1704–1782. Bp. of Bristol 1761. *On the Prophecies*, 1754–58.

**Newton's Disk.** Device for showing that the seven colors of the spectrum form white. It depends on the principle of persistence of vision. It consists of a circular disk of card-board mounted on a horizontal axis and capable of being rapidly rotated. The disk is divided radially into seven sectors, colored in the order of the spectrum colors. The result is a grayish white.

**Newton's Law of Cooling.** This applies to the cooling of solids or liquids when exposed in a chamber of uniform temperature. At each instant the amount of heat lost varies as the difference of temperature between the body and the chamber. The proportionality is sensibly exact when this difference does not exceed a few degrees. In symbols we may express the law,

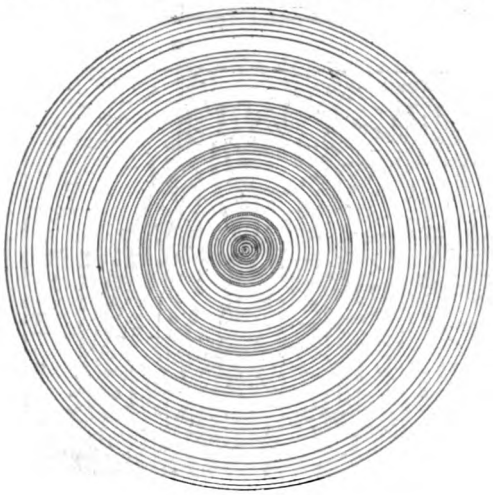
$$-\frac{d\delta}{dt} = A\delta,$$

in which $\delta$ is the excess of temperature of the body above the chamber at time t, and A is a constant, depending upon the nature of the substance.

**Newton's Laws of Motion.** 1. Every body perseveres in its state of rest or uniform motion in a straight line, except in so far as it is made to change that state by external forces. 2. The change in the motion of a body is numerically equal to the impulse which produces it, and is in the same direction. 3. To every action there is developed an equal and opposite reaction. See MOBILITY.

**Newton's Rings.** Phenomenon of interference produced by a thin layer of air obtained by pressing into more or less intimate contact two glass surfaces, one plane, the other slightly curved. The interference takes place between rays of light reflected from the two surfaces of the film of air. Those reflected from the second surface are slightly retarded, the amount being proportional to the thickness, which is variable. When this retardation is just half a wave-length, there is complete interference, and the result in monochromatic light is a

dark ring with the point of closest contact at the center. Alternate with the dark rings are bright ones, produced by the interference of rays which emerge in the same phase. If the



Newton's Rings.

light employed is not homogeneous, the bright rings are colored, the colors being arranged from the center outward in the inverse order of the prism spectrum.

**Newton Theological Institution.** Founded 1825 at Newton Centre, Mass., by Baptists. It has 7 professors, ab. 90 students, a library of 20,000 vols., and an endowment of $400,000.

**New Year's Day.** Jan. 1, Feast of the Circumcision. Its main observance is secular.

**New York.** Most populous and wealthy of the States. Its area is 49,170 sq.m. In the n. part is the mountain group known as the Adirondacks. Around this to the n. and w. stretches low and densely forested country to the St. Lawrence and Lake Ontario. S. of it is the Valley of the Mohawk; further s. is an area of high land known as the Catskill plateau; e. of this is the valley of the Hudson. The central and western parts of the State are mainly made up of the n. extension of the Allegany plateau. The Hudson, navigable to Troy, is the only navigable stream of the State.

The Adirondack region is one of Archæan rocks. On the n. these are flanked by Cambrian and Silurian beds; in the s. the valleys of the Mohawk and Hudson and the shores of Lake Ontario are Silurian; the s. portion is formed of Devonian rocks.

The industries are varied. Most of the foreign commerce of the U. S. enters at the Port of New York. The State has an extensive railroad system comprising, 1892, 8,116 m. It has large and varied manufactures, and its agricultural and pasturage interests are large, especially in the manufacture of butter and cheese and the production of wool. Its agricultural product in 1889 was valued at $161,593,009. Iron is mined near Lake George; about Syracuse salt is produced from salt wells, and in the western portion it is mined.

The region was almost simultaneously explored by Champlain, who entered it from the n. 1609, and by Henry Hudson, from the sea. The result of Champlain's expedition was the enmity of the Indian Five Nations, who remained hostile to the French until they surrendered their possessions in America. The result of Hudson's expedition was the exploration of the Hudson River as far as Albany, and the claim of all this territory for the Dutch as New Netherlands. In 1621, owing to the increasing prospects of lucrative trade with America, the Dutch West India Company was formed for purposes of trade and colonization.

The English government also laid claim to N. Y. on the ground of anterior discoveries by Cabot. In 1664 a charter was granted by Charles II. to the Duke of York, covering all the lands between the Hudson and the Delaware; Col. Nicolls was sent out to demand the surrender of the province, the Dutch were powerless to prevent it, and the New Netherlands became N. Y.

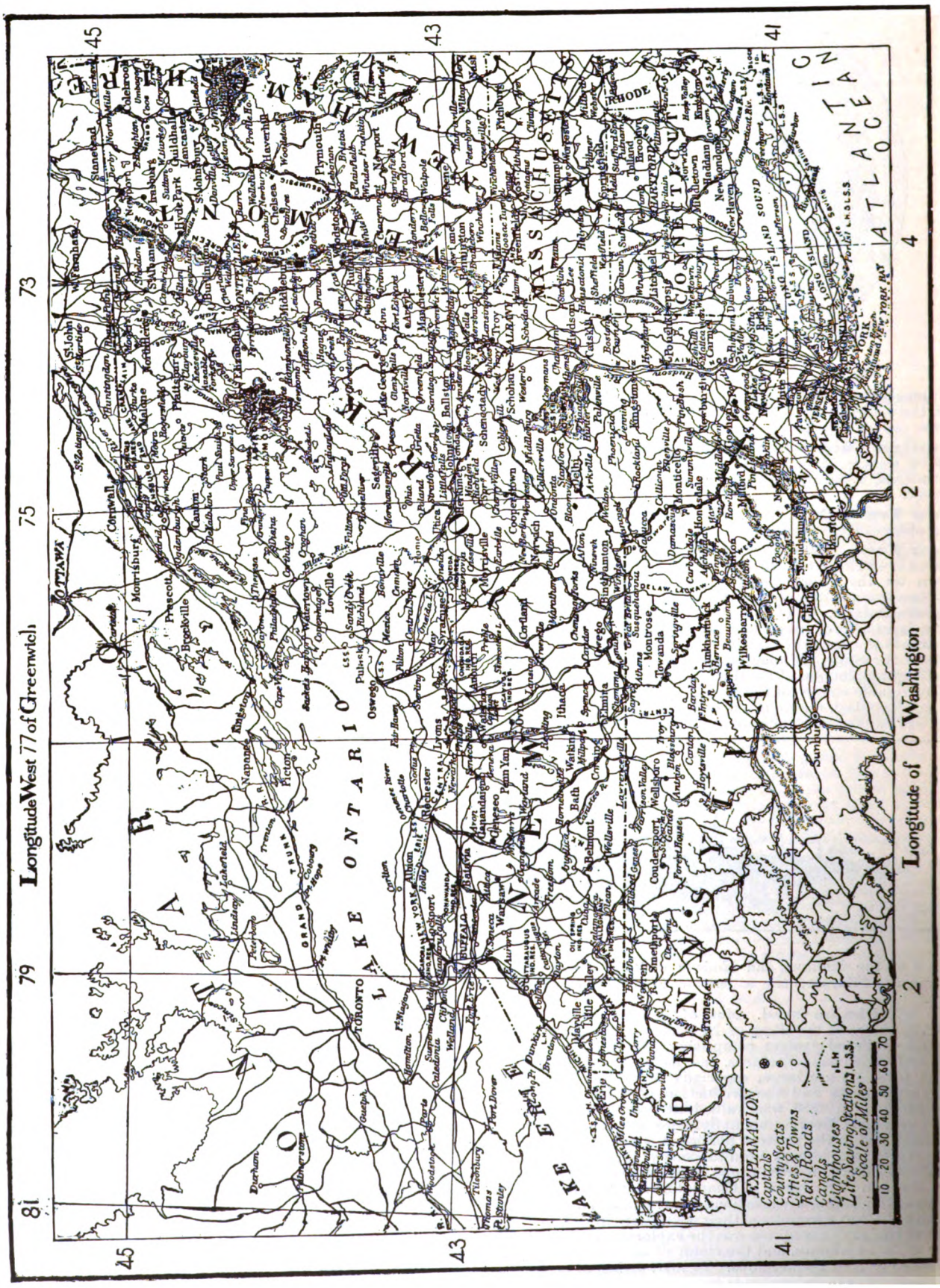
The English settlers had constant difficulties with the French, who held the points on the n. and along Lake Champlain. These conflicts did not cease until the final surrender by the French of their American possessions, 1763. During the Revolution, the State was among the foremost in defense of American independence. N. Y. City was in 1776 the headquarters of the Continental army. Pop., 1890, 5,997,853, of whom full one-fourth are of foreign birth, and more than half live in cities. (See Map, page 143.)

**New York.** City and co. of N. Y., the largest and chief commercial city in the U. S., and, next to London, largest in the world. It occupies within its corporate limits all of Manhattan Island, which lies between the Hudson and East rivers, and a considerable area of the mainland of what was formerly Westchester co. Its harbor is one of the finest in the world, being easy of access, and of ample area and depth for all classes of navigation. It is the terminus of 7 railroads, while at Jersey City, just across the Hudson, 13 other railroads terminate, connecting with the metropolis by ferries. The area within the corporate limits is 40.3 sq. m., of which somewhat more than one-half is upon Manhattan Island. It has 565 m. of streets, of which 360 m., including nearly all upon the island, are paved. It has 65 lines of railroads, with 327 m. of road, while the elevated railroad companies have 100 m. of road. Water is supplied by gravity from Croton River, and is brought by two aqueducts of masonry 40 m. in length, which have a capacity of 400,000,000 gals. per day. The reservoirs are in Westchester Co. and in Central Park. This, situated in the upper part of the island, has an area of 862 acres. There are other smaller parks scattered over the city, among them being the Battery, at the s. end of the island, Bowling Green, City Hall Park, Union Square, Madison Square, etc. The parks above the Harlem River have an area of 3,843 acres. The city is thoroughly sewered, the discharge being into the Hudson and East Rivers by numerous outlet sewers. The commerce of New York was in 1894 as follows: Value of imports, $415,795,991; value of exports, $359,192,983. Its manufactures, which are very large and varied, employed in 1890 a capital of $426,118,273 and produced a value of $777,222,721.

Of educational institutions it contains Columbia Univ. and that of the City of New York, besides several smaller institutions. Central Park contains a menagerie, the Metropolitan Museum of Art, the Obelisk, lakes, drives, etc. The Museum of Natural History is in Manhattan Square, near by. The Hudson offers 16 m. of water front, and the East River several m. more. Ab. 16,000 ocean vessels visit the harbor annually. More than half the foreign commerce of the U. S. passes through this port and most of the immigration enters here.

New York City.

Verrazani was the first European to set eyes on Manhattan Island, 1524. Hudson explored the river 1609. A trading station was established by the Dutch 1611, a fort built 1614, and a settlement effected in 1623 and named New Amsterdam. In 1652 it became a city, and in 1653 was defended by a wall across the island on the n., of whose site Wall St. is the permanent memorial. It was seized by a British fleet Aug. 1664, in 1673 by a Dutch fleet, but restored to the English 1674. The first colonial assembly met here 1691; the first newspaper appeared 1725; King's Coll., now Columbia, was chartered 1754. The British held the city Sept. 15, 1776 to Nov. 25, 1783. It was the capital of the U.S. 1785–90, and of the State 1784–97. Cholera ravaged the city 1832. A three-days' fire destroyed much property 1835. Croton water was introduced 1842. In May, 1849, occurred the Astor Place riots; in July, 1863, the Draft riots, in which more than 1,000 were killed and wounded. The World's Fair was opened in the Crystal Palace 1853; the Brooklyn Bridge was opened May 24, 1883. "Greater N. Y." (the bill for which became a law May 2, 1896) is planned to include Brooklyn, Long Island City, Richmond Co., Flushing, Hempstead, Jamaica, Newtown, East and West Chester, and Pelham, the total population of which was estimated (1896) to exceed 3,000,000. The


Longitude West 77 of Greenwich
Longitude of 0 Washington
LAKE ONTARIO
LAKE ERIE
ATLANTIC OCEAN
NEW YORK
PENNSYLVANIA
VERMONT
MASSACHUSETTS
CONNECTICUT
RHODE ISLAND
LONG ISLAND SOUND
TORONTO
BUFFALO
ROCHESTER
SYRACUSE
ALBANY
TROY
BOSTON
NEW YORK
EXPLANATION
Capitals
County Seats
Cities & Towns
Rail Roads
Canals
Lighthouses
Life Saving Stations
Scale of Miles
10 20 30 40 50 60 70

census of N. Y. in June, 1890, showed a pop. of 1,515,301; the State census, 1892, 1,801,739.

**New York,** COLLEGE OF THE CITY OF. Established 1848 as a Free Academy: granted collegiate privileges and powers 1854; thus named 1866. It offers 3 five-year courses, classical, scientific, and mechanical. In 1896 it had a teaching staff of 50, and a library of 30,000 vols.

**New York System.** In Geology, division of Paleozoic rock, comprising all the formations of the State from the Potsdam sandstones below to the Chemung group above.

**New York University.** Founded 1831. The School of Medicine was added 1841, that of Law 1858, the Graduate dept. 1886, that of Pedagogy 1890: new buildings were erected 1895. Union Theological Seminary has been affiliated since 1890. Women are admitted to graduate courses. There are, 1896, 63 professors, 49 lecturers and instructors, 22 assistants, and 1,223 students.

**New Zealand.** Group consisting of two large islands and several smaller ones, s.e. of Australia, in the s. Pacific. The area of the northern one is 44,467 sq. m., and that of the southern 58,525 sq. m. Both are mountainous, having peaks several of which are volcanoes, 8,000 to 12,000 ft. high. On the n. island are hot springs, rivaling in some respects those of the Yellowstone Park. The capital is Wellington. The British colony includes also Stewart Is., the Chatham, Auckland Is., and others; total area 104,471 sq. m. The coast line is over 3,000 m., and includes many good harbors. The soil is fertile, the climate mild. N. Z. was discovered 1642. Capt. Cook, the first European to land here, took possession for Gt. Britain 1769. The islands were little visited till missions were introduced 1814. During the next 30 years the population became nominally Christian; cannibalism ceased, and colonization made rapid progress. Pop., 1891, 628,658, of whom 43,642 were Maoris.

**Ney,** MICHEL, 1769–1815. French general 1796, Marshal 1804; made Duke of Elchingen 1805, and Prince of Moskwa 1812; distinguished in Germany, Spain, and Russia, especially at Borodino and in the retreat, as later at Lützen, Bautzen, and Leipzig. He advised Napoleon to abdicate, and on the return from Elba was sent against him, but joined him, commanded at Quatre Bras, and held the center at Waterloo. For this he was condemned by the Peers, and executed in Paris. Some maintain that he escaped and taught school in N. C. for years.

**Nez Percés.** Idaho Indians, now numbering ab. 2,000, on four reservations. In 1877 they revolted, under Chief Joseph, and were subdued.

**Ngami.** African lake, lat. 20° 30′ S., long. 23° E.; ab. 50 m. by 15. See NYANZA.

**Niagara.** River connecting lakes Erie and Ontario, and serving as a boundary between N. Y. and Canada. Niagara

Niagara Falls, ab. 1690.

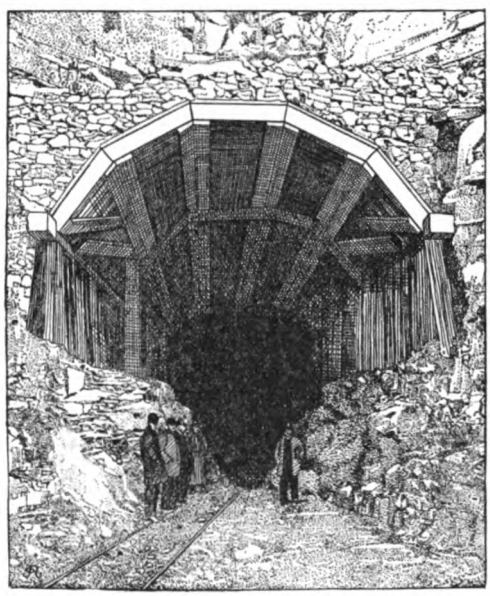
Falls are separated by Goat Island. The American Fall is 164 ft. high; the Horseshoe, on the Canadian side, 150 ft. They are surmounted by vessels by the Welland Canal. The descent in a mile above the fall is 50 ft. The gorge below is ab. 7 m. long and from 800 to 1,500 ft. wide. The fall recedes on the N. Y. side ab. 6 in. annually, on the Canadian side from 3 to 5 ft. The volume of water passing each second is 280,000 cu. ft. An extensive water-power has been constructed on the American side (see NIAGARA TUNNEL). The 10 turbines provided for will supply 50,000 horse-power, which is converted into electricity. The total power of the falls is estimated at 4,000,000 horse-power, or an equivalent to all the steam and water-power used in the U. S.

**Niagara,** FORT. Taken by the English from the French 1759; occupied by Americans 1812; captured by the British Dec. 19, 1813.

**Niagara Bridges.** A railroad suspension bridge across the Niagara River, about one mile below the falls, was built by Roebling 1852. It has a span of 821 ft.: both the original trusses and the towers have been replaced by others. A highway suspension bridge near the American Fall, built by Keefer 1869, has a span of 1,264 ft. A cantilever structure, built by Schneider 1883 near Roebling's bridge, has a total length of 910 ft. and a central span of 495 ft. See BRIDGES and CANTILEVER BRIDGE.

**Niagara Limestone.** Richly fossiliferous stratum in the Upper Silurian system of N. America, forming the ledge of the great falls; equivalent of the English Wenlock. See SILURIAN.

**Niagara Tunnel.** 7,000 ft. long: it brings the water from a power plant above the falls to the river below the American Fall. At the power plant the tunnel is 136 ft. below the sur-



Niagara Tunnel.

face, and there it receives the water discharged through the large turbines. It is horseshoe-shaped, 21 ft. high, and 19 ft. wide at the widest part. The tunnel was completed 1894; its cost, including the head canal, was $3,500,000.

**Nias.** Island of the e. Archipelago, off the w. coast of Sumatra, occupied by the Dutch since 1857; area 2,100 sq. m. Pop. ab. 250,000.

**Nibelungenliêd.** Epic in Middle High German, ab. 1200, of unknown authorship; in two parts, each containing ten songs. It is marked by the presence of a few great characters: Kriemhilde, Siegfried, Hagen, Brünhilde, and Etzel.

**Nicæa,** or NICE, COUNCIL OF. Convoked by Constantine 325. It condemned Arianism, and affirmed the consubstantiality of the Son with the Father. A second Council, 787, approved icons.

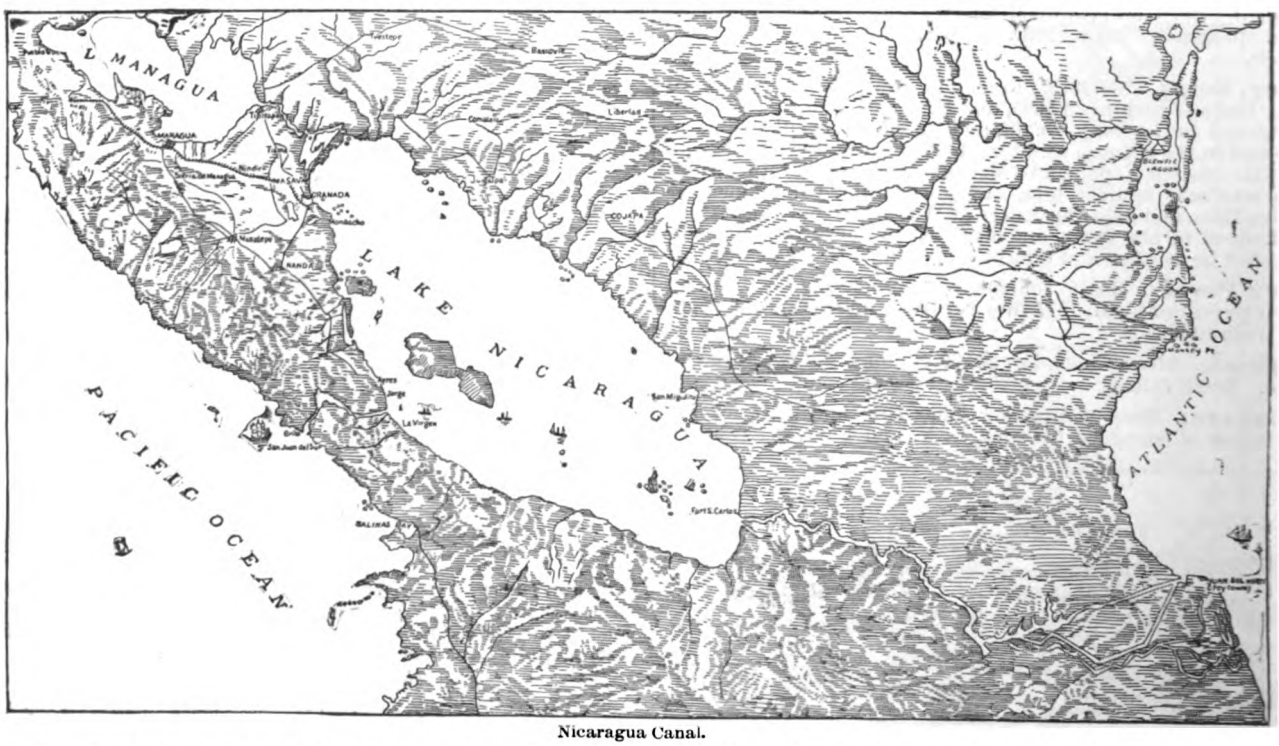
**Nicander,** 2d cent. B.C. Greek poet, from whom we have *Theriaka*, on wild animals, and a work treating of poisons and the antidotes for them.

**Nicaragua.** Republic of Central America, between Honduras and Costa Rica; area ab. 50,000 sq. m. The interior consists of a landlocked basin, but little above the level of the sea, the lowest parts of which are occupied by the lakes N. and Managua. E. of this is a mountain range, rising to a mean height of 4,000 to 5,000 ft., cut through by the Rio San Juan, which drains the lakes to the Caribbean Sea. E. of this range is the low, swampy Mosquito coast. W. of this depression is a line

of volcanoes, of no great height, but still showing activity; in this range are several very low passes, one of which is to be utilized by the projected N. ship canal. The climate is tropical, with a heavy rainfall. The agricultural productions consist mainly of sugar, coffee, and tropical fruits. The capital is Managua. N. was discovered by Columbus in his fourth voyage, 1502, but not explored till 1522. Its history has been one of external and internal disturbance. Independence was declared 1821, and acknowledged by Spain 1850. In 1823 it joined the federal union of the five Central-American States, which was dissolved 1833. In 1856 Gen. Walker seized the supreme power, but was expelled and shot 1860. A new Constitution was adopted 1858. A period of comparative peace has followed, interrupted by a civil war 1893. In 1895 N., Honduras, and Salvador formed the Central-American Union, with a diet of 2 members from each to take charge of foreign and commercial affairs. Pop., 1890, 360,000, chiefly Indians and half-breeds; ab. 18,000 are Europeans, mainly Spaniards.

**Nicaragua,** LAKE. Connected with the Atlantic at Greytown by the St. John's; mostly shallow.

**Nicaragua Canal.** Proposed across Nicaragua and Costa Rica. The total length is 170 m., of which 29 are canal proper, 141 being in river and lake navigation. The elevation of the summit level above tide-water is 110 ft., which will be surmounted by 8 locks. The route follows the deepest depression of the Isthmus, including Lake N., and extends from Greytown on the Atlantic to Brito on the Pacific. A concession for its construction was obtained 1849, abrogated 1856 on account of nonfulfillment by the company of certain conditions, and renewed 1857, subject to the decision of arbitrators not yet appointed. The Maritime Canal Co. of Nicaragua was incorporated by U. S. Congress 1889. Preliminary work on the construction was begun, and $2,000,000 expended by Oct. 1890. The work was suspended 1893. The estimated cost is $87,799,570. By the Clayton-Bulwer treaty of 1850 the governments of the U. S. and Gt. Britain agree that neither will obtain or maintain exclusive control over the canal.



Nicaragua Canal.

**Niccolini,** GIOVANNI BATTISTA, 1782–1861. Italian poet, dramatist, and critic. *Arnold of Brescia*, 1843.

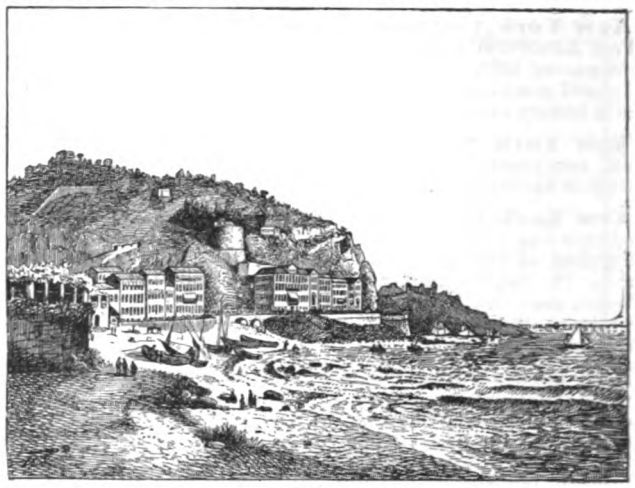
**Niccolite.** NiAs. Nickel arsenide, commonly called copper nickel from its pale copper-red color, occurring in many localities in company with ores of cobalt and of silver, though not often in large quantity.

**Niccolo da Pisa.** See PISANO, N.

**Niccolo,** LAMBERTI, or DI PIERO, 1350–1417. Sculptor and architect of Arezzo and Florence.

**Nice,** or NICÆA. City of Bithynia, n.w. Asia Minor, founded 316 B.C. as Antigonia; famous for the council held and creed framed there 325; now Isnik.

**Nice,** or NIZZA. City and seaport of s.e. France, at the mouth of the Paglione; noted health resort; settled by Greeks


Nice.

from Marseilles; held by Savoy 1388–1792; besieged and despoiled by Turks under Hayraddin 1543; ceded by Sardinia to France 1860. Pop., 1891, 74,250.

**Nicene Creed.** Proposed in part by First General Council, at Nicæa, 325; supposed to have been amplified by that of Constantinople, 381; not traced in its present form back of that of Chalcedon, 451. It is generally received throughout Christendom.

**Nicephorus I.** Byzantine Emperor 803–811, defeated and killed in Bulgaria.—II. 963–969; also called Phocas II.—III. 1078–81.

**Nicephorus,** 758–828. Patriarch of Constantinople 806, and its historian; deposed and banished 815.

**Nicetas,** ab. 1135–1206. Byzantine historian. His work begins with 1118.

**Niche.** Arched recess in a pier or wall, commonly designed to hold a statue, case, or other ornament, and sometimes surmounted with an elaborately wrought canopy.

**Nichiren,** 1222–1282. Founder of a Buddhist sect in Japan.

**Nichol,** JOHN, LL.D., 1833–1894. Prof. Glasgow 1861–89. *Byron*, 1880; *American Literature*, 1882; *Burns*, 1882; *Bacon*, 1888.—His father, JOHN PRINGLE, LL.D., 1804–1859, was Prof. of Astronomy. *Planetary System*, 1851; *Physical Sciences*, 1857.

**Nicholas,** St., d. 326. Bp. of Myra in Lycia, Asia Minor; patron saint of Russia and of children. His day is Dec. 6.

**Nicholas I.** Pope 858–867; aggressive, and engaged in various controversies. He and Photius of Constantinople excommunicated each other.—II. Gerhard, a Burgundian, Bp. of Florence, pope 1058–61; led by Hildebrand; first to wear the double crown. A synod 1059 secured the election of popes to the cardinals.—III. Giovanni Gaetina Ursini, pope 1277–80.—IV. Gen. of the Franciscans 1274, pope 1288–92: also an anti-pope, 1328–30.—V. Tommaso Parentucelli, b. 1398, Abp. of Bologna 1444, pope 1447–55; scholar and patron of learning.

**Nicholas I.,** 1796–1855. Emperor of Russia 1825; third son of Paul. He suppressed a military conspiracy 1826, gained increase of territory from Persia and Turkey 1828–29, converted

Nicholas I.

Poland into a Russian province 1830, and aimed by every means to aggrandize his empire and Church. His plans were checked by the results of the Crimean war, which he began.

**Nicholas II.,** b. 1868. Czar 1894; son of Alexander III.

**Nichols,** Edward Leamington, b. 1854 in England. Prof. Cornell 1887. *Physics and Mechanics*, 1894.

**Nichols,** John, 1745–1826. Ed. *Gentleman's Magazine* from 1778; successor and biographer, 1778–82, of Wm. Bowyer, the printer. *Literary Anecdotes*, 9 vols., 1812–15. His *Illustrations of Literary History*, 8 vols., 1817–58, were continued by his son, John Bowyer, 1779–1863, whose son, John Gough, 1806–1873, was a noted antiquarian.

**Nicholson,** Henry Alleyne, b. 1844. English geologist. *Manual of Paleontology*.

**Nicholson,** James, 1737–1804. Commander U. S. Navy 1777.—His grandnephew, James William Augustus, U.S.N., 1821–1887, became Admiral 1881.

**Nicholson,** John, 1822–1857. Irish officer in India, prominent in the Punjab; killed at Delhi.

**Nicholson's Blue.** $C_{38}H_{40}N_3SO_3Na$. Sodium salt of triphenylrosanilinemonosulphonic acid; containing also the corresponding salt derived from pararosaniline, made by the action of sulphuric acid upon Spirit-blue; blue powder, easily soluble in hot water; used in wool-dyeing.

**Nicias,** d. 413 B.C. Athenian general, leader of the aristocratic party; negotiator of peace with Sparta 421 B.C.; in charge of Sicilian expedition 415, which ended in disastrous failure; executed at Syracuse.

**Nickel.** Ni. At. wt. 58.7, sp.gr. 8.9, mpt. 1,400° C., sp. ht. 0.11, valence II. III. Discovered by Cronstedt 1751; unaltered in the air; attracted by the magnet. It dissolves with difficulty in hydrochloric and sulphuric acids, but readily in nitric acid. It forms two classes of salts, nickelous, in which it is bivalent, and which are the more stable, and nickelic, in which it is trivalent. It is of wide distribution in nature, occurring in several mineralogical combinations, and produced in recent years on a large scale for use in the arts and in subsidiary coinage.

**Nickel,** Metallurgy of. Nickel occurs in nature as sulphide, NiS (millerite); arsenides, NiAs (niccolite), and $NiAs_2$ (chloanthite); sulph-arsenide, $NiS_2+NiAs_2$ (gersdorffite); hydrous arsenate, $3NiO.As_2O_5.8H_2O$ (annabergite or nickel ochre); hydrous silicates with magnesia (genthite, pimelite, garnierite). Iron pyrites, magnetic pyrites, copper pyrites and arsenical pyrites frequently contain several per cent of nickel as an accidental constituent. The principal deposits now worked for nickel are the hydrous silicates on the island of New Caledonia, Pacific Ocean (owned by French capitalists), and the nickel-bearing pyrrhotite (magnetic pyrites) of Sudbury, Canada. The former contain on an average (after dressing) 5 to 10 per cent of nickel, the latter, as mined, 3 per cent each of nickel and copper.

The silicate ore of New Caledonia is now treated exclusively in Europe (Glasgow, Birmingham, Havre, Iserlohn). It was formerly worked at the mines, by smelting in blast furnaces, with coke as fuel, and limestone, fluorspar, and soda as fluxes. The product was an iron-nickel alloy or "raw nickel," containing nickel 60 to 75 per cent, iron 20 to 30 per cent, and some carbon, silicon, and sulphur. This was shipped to Europe and there converted into pure nickel by an oxidizing smelting with sand, by which the iron was removed as silicate, and then with lime, which removed silicon and sulphur. This method never produced very pure nickel, and has therefore been abandoned. The present method of working the ore in Europe is to smelt it in a shaft furnace with some sulphur-bearing material (gypsum), by which all the nickel and part of the iron form a hard sulphide or matte. The reactions are, first, the reduction of gypsum (calcium sulphate) by the fuel to calcium sulphide; second, the action of this on the nickel silicate to form nickel sulphide and a calcium silicate slag. The waste calcium sulphide of the soda industry may be advantageously used instead of gypsum. The nickel matte is purified from iron and copper by roasting and fusion in reverberatory or shaft furnaces, or by "Bessemerizing," *i.e.*, blowing air through it as in a Bessemer-steel converter, sand being present to slag off the iron. The purified nickel sulphide is roasted to oxide and then reduced by carbon to the metallic state.

The Sudbury ores are first roasted in heaps containing several hundred tons, and then smelted in a blast-furnace to an iron-copper-nickel sulphide, or matte, the gangue of the ore passing off as slag. The raw matte has been treated in several ways, the object being to first separate out the iron and copper sulphides. "Bessemerizing," or placing molten in a vessel like a steel converter, lined with silica brick, and then blowing air through, will oxidize most of the iron and slag it off as silicate. The same object is attained more slowly by partially roasting the granulated matte on the hearth of a reverberatory furnace, sprinkling with sand, and then melting down. To remove copper, the matte is partially roasted, mixed with salt, and roasted again. This converts the nickel into oxide, but the copper into chloride, which can be washed out. These methods of treating the raw matte from the first fusion, or the concentrated matte from the converters, have been greatly improved upon by Thompson's process, in use at the Orford Copper Company's works at Constable Hook, N. J. The iron-copper-nickel sulphide is smelted with sodium sulphate and carbon, whereby the sodium sulphide produced unites with the iron and copper to form an easily-fusible sulphide almost entirely free from nickel, which floats upon the pure nickel sulphide and, after setting of the mass, is easily separated from it. By two or three such treatments, the nickel sulphide is almost completely freed from copper and iron.

The pure nickel sulphide obtained in any of these ways is broken up and roasted at a high heat to oxide. This is mixed with carbon and reduced to nickel sponge on the bed of a reverberatory furnace. The sponge is welded together to solid nickel, or it may be melted down at a high temperature and cast into ingots or granulated in water. In the casting of nickel, the addition of a small quantity of magnesium or aluminium frees the bath from nickel oxide and gives much better metal. The Orford Copper Co. cast some of their nickel into large anode plates, which are then refined electrolytically, producing the purest nickel yet put on the market (99 to 99.3 per cent pure).

Pure nickel has the following properties: Color nearly silver-white, slightly steel-gray; specific gravity 8.35 (cast) to 8.9 (rolled); malleable and ductile; tensile strength 80,000 to 100,000 lbs. per sq. in.; magnetic (below 350° C.); specific heat 0.11, increasing with the temperature; melting point 1,400° C. Soluble easily in dilute nitric acid; unoxidized by air, even at high temperatures.

*Production and Uses.*—The annual production of the world is 4,000 tons, of which Canada and New Caledonia each contribute ab. 40 per cent. The market price varies between 25 and 40 cents per lb. The principal uses are for making German silver, nickel coinage, and nickel-steel. Watch cases, watch chains, chemists' crucibles, and Swiss minor coins are made of the pure metal. German silver contains usually 5 parts copper, 2 nickel, and 2 zinc. The nickel coins of Germany, U. S., etc., contain

75 parts copper to 25 parts nickel. Nickel-steel is made by putting either nickel or nickel oxide into the steel-making furnace. The armor-plates of the Bethlehem Iron Co. contain 3.5 per cent of nickel; foreign armor-plates up to 8 per cent. Nickel-steel, if properly forged, is the toughest and strongest kind of steel manufactured.

**Nickel Bloom.** See ANNABERGITE.

**Nickel Disulphide.** $NiS_2$. Dark iron-gray powder, obtained by heating nickel carbonate with potassium carbonate and sulphur.

**Nickelic Oxide.** $Ni_2O_3$. Made by heating the nitrate.

**Nickelous Brom Ammonia.** $NiBr_2.6NH_3$. Bright violet powder, made in the same way as the corresponding CHLOR COMPOUND (q.v.).

**Nickelous Bromide.** $NiBr_2$. Yellow mica-like scales, made in the same way as the CHLORIDE (q.v.). It occurs also in $NiBr_2+3H_2O$.

**Nickelous Carbonate.** $NiCO_3$. Pale-green, transparent, microscopic rhombohedra, not attacked by concentrated hydrochloric or nitric acids in the cold; made from nickelous chloride and a solution of sodium carbonate saturated with carbon dioxide.

**Nickelous Chlor Ammonia.** $NiCl_2.6NH_3$. White powder, obtained by passing dry ammonia over anhydrous nickelous chloride; or large dark blue octahedra, from an ammoniacal solution of the chloride.

**Nickelous Chloride.** $NiCl_2$. Crystalline scales, resembling mosaic gold; formed by heating the metal in a current of chlorine; obtained as $NiCl_2+6H_2O$ on evaporating a solution of the oxide in aqua regia.

**Nickelous Cyanide.** $4Ni(CN)_2+3H_2O$. Greenish-white insoluble precipitate, obtained by adding a solution of potassium cyanide to a nickelous salt.

**Nickelous Fluoride.** $NiFl_2+2H_2O$. Long green prisms, obtained by treating the carbonate with hydrofluoric acid.

**Nickelous Hydroxide.** $Ni(OH)_2$. Bright green precipitate, obtained by adding an alkali to the solution of a nickelous salt. Heated, it yields nickelous oxide, gray.

**Nickelous Iodide.** $NiI_2$. Iron-black leaflets, obtained by heating nickel with iodine.—$NiI_2+6H_2O$. Bluish-green prisms, obtained in evaporating an aqueous solution.

**Nickelous Nitrate.** $Ni(NO_3)_2+6H_2O$. Green, monoclinic crystals, isomorphous with $CO(NO_3)_2$; soluble in water and alcohol; made by dissolving nickel in nitric acid and evaporating.

**Nickelous Nitrite.** $Ni(NO_2)_2$. Reddish-yellow crystal crusts, soluble in water; formed by treating barium nitrite with nickelous sulphate.

**Nickelous Oxide.** NiO. Greenish-yellow to olive green powder, obtained by heating the corresponding hydroxide or carbonate. It occurs in nature as Bunsenite.

**Nickelous Phosphate.** $Ni_3(PO_4)_2+7H_2O$. Obtained as an apple-green precipitate on adding sodium phosphate to nickelous nitrate.

**Nickelous Sulphate.** $NiSO_4+7H_2O$. Green rhombic prisms, made by treating the oxide or hydroxide with sulphuric acid. It forms double sulphates.

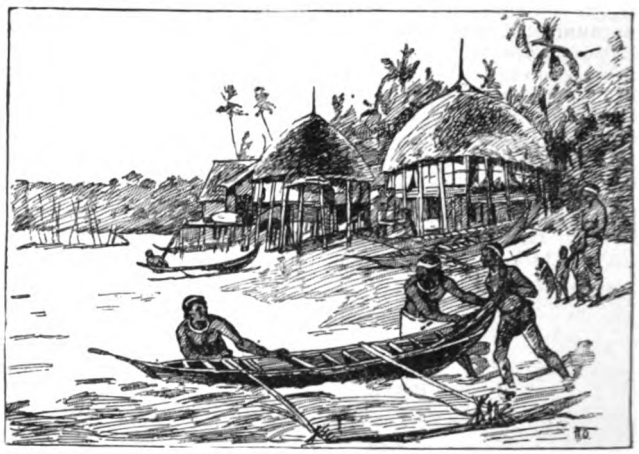
**Nickelous Sulphide.** NiS. Dark-gray amorphous powder, obtained by heating nickel with sulphur.

**Nickel Plating.** This is usually accomplished in a 6 to 9 per cent, faintly acid solution of nickel-ammonium sulphate, deposited by means of a dynamo-electric machine. The anode is rolled nickel. Boric acid is sometimes added to the plating solution. The coating is bluish, hard, and admits of a high polish with quicklime; it is not as readily discolored by sulphureted gases as is silver.

**Nickel Steel.** Steel containing from 3 to 30 per cent of nickel. It is tough, strong, and mainly used for armor plates, guns, and shafts. It has been made with an ultimate tensile strength of 277,000 and an elastic limit of 100,000 pounds per sq. in.

**Nickel Tetracarbonyl.** $Ni(CO)_4$. Colorless liquid; bpt. 43° C., sp. gr. 1.38. It solidifies at −25° C. to needle-like crystals, which are not attacked by dilute acids. It is soluble in water: its vapor burns with a luminous flame. It is made by passing dry carbon monoxide over nickel, heated to 100° C. It is a strong poison when injected under the skin.

**Nicobar Islands.** In Indian Ocean, 125 m. n.w. of Sumatra; held by Britain since 1869. The coasts are difficult of approach by reason of the surf and strong tides and currents, but it has an excellent harbor on Nancowry Island. The islands



Village in the Nicobar Islands.

are notoriously unhealthy from malaria. Area ab. 630 sq. m., pop. (Malay) ab. 7,000.

**Nicodé,** JEAN LOUIS, b. 1853. German musician; prof. at Dresden Conservatory 1878–85; conductor of the Philharmonic Concerts 1885–88; composer of a symphony with chorus, *Das Meer*, *Symphonic Variations*, and the symphonic poem, *Maria Stuart*.

**Nicodemus.** Member of the Jewish Sanhedrim and secret disciple of Jesus.

**Nicol,** ERSKINE, b. 1825. Scottish painter.

**Nicol,** JAMES, 1810–1879. Scottish geologist. He maintained, in opposition to Murchison, that the Crystalline rocks of the Highlands were very ancient, and not secondary strata metamorphosed. This controversy was settled in his favor 1866, when the confusion was shown to arise from a thrusting of the Archæan Gneiss over rocks of later date along what are called Thrust Planes. *Manual of Mineralogy*, 1849; *Elements of Mineralogy*, 1858.

**Nicolai,** CHRISTOPH FRIEDRICH, 1733–1811. German author; ed. *Bibliothek*, 1765–92.

**Nicolai,** OTTO, 1810–1849. German opera composer; founder of the Vienna Philharmonic concerts. His *Merry Wives of Windsor*, 1848, still holds the stage and is among the most successful settings of a Shakespearian subject. His first operas were Italian.

**Nicolai,** PHILIPP, D.D., 1556–1608. German hymnist.

**Nicolaiev.** Fortified city of Russia, at the junction of the rivers Ingul and Bug; chief naval station in the Black Sea. Pop., 1891, 76,578.

**Nicolaitans.** Christian heretics of evil life, denounced Rev. ii. 6. 15.

**Nicolas,** SIR NICHOLAS HARRIS, 1799–1848. English antiquary. *Peerage*, 1825; *Privy Council*, 7 vols., 1833–37; *Orders of Knighthood*, 4 vols., 1841–42; *Dispatches and Letters of Nelson*, 7 vols., 1844–46; *Hist. British Navy*, 1847.

**Nicolaus** OF DAMASCUS. Greek historian and biographer of the Augustan age. Fragments survive.

**Nicolay,** JOHN GEORGE, b. 1832. Sec. to Pres. Lincoln 1861–65, and author, with John Hay, of his monumental *Life*, 12 vols., 1891–94.

**Nicole,** FRANÇOIS LÉON ÉTIENNE, 1731–1773. Haytian poet.

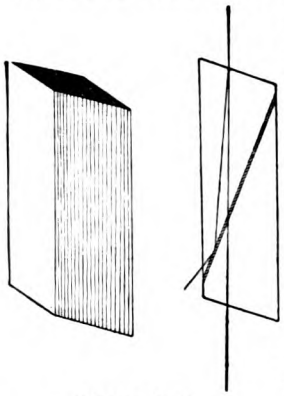
**Nicole,** PIERRE, 1625–1695. French Jansenist, author, with A. Arnauld, of the Port Royal *Logic*, 1659. *Essais de Morale*, 14 vols., 1672–90.

**Nicoll,** ROBERT, 1814–1837. Scottish poet.

**Nicoll,** WILLIAM ROBERTSON, LL.D., b. 1851. Scottish author, founder and ed. *British Weekly*, 1886, *Bookman*, 1891, and other periodicals.

**Nicollet,** JEAN NICOLAS, 1786–1843. French explorer of the s.w. States 1832–40, of which region he constructed the first geological map.

**Nicol's Prism.** Rhomb of Iceland spar, divided diagonally through the obtuse solid angles into two halves and then cemented together with Canada balsam, the dividing section being at such an angle to the face that when a ray of common light enters the rhomb and is divided into two polarized rays, the ordinary ray shall be totally reflected when it meets the surface of the balsam, while the extraordinary ray is transmitted and emerges in a direction parallel to that of the incident ray. It may thus be used as a polarizer. It transmits plane polarized light in one position, but absorbs it entirely if rotated 90° upon its axis. It is capable therefore of being used as an analyzer also.



Nicol's Prisms

**Nicomedia.** City built 264 B.C. at e. extremity of Propontis; capital of Bithynia, and of the East before the founding of Constantinople; birthplace of Arrian. Hannibal and Constantine died near it.

**Nicopolis.** City founded by Augustus after the victory at Actium, 31 B.C., on the site of his camp. Pompey founded another in Lesser Armenia to signalize his victory over Mithridates, 66 B.C. In Asia were 4 towns of this name, in Europe, 5, and Africa, one.

**Nicopolis.** Town of Bulgaria, on the Danube; founded 106. Here Sigismund, King of Hungary, was defeated by the Turks under Bajazet Sept. 28, 1396, losing some 20,000 slain, and 20,000 wounded and prisoners. It was taken by the Russians July 16, 1877. Pop., 1888, 5,156.

**Nicosia,** or LEVCOSIA. Capital of Cyprus, near the middle

Nicosia.

of the Mesaorea or great plain of the island, 23 m. n.w. of its port of Larnaha; taken 1570 by Turks. Pop. ab. 12,500.

**Nicot,** JEAN, 1530–1600. French diplomatist and lexicographer. The tobacco-plant which he brought into France, is named from him.

**Nicotine.** $C_{10}H_{14}N_2$. Bpt. 241° C. This poisonous alkaloid is a pyridine derivative. It is an oily substance with a horrible odor, easily soluble in water. It is a distinctive principle of the tobacco-plant, and obtained from it. Upon oxidation it yields nicotinic acid.

**Nicotinic Acid.** $C_5H_4N.COOH$. Mpt. 231° C. $\beta$-pyridine carbonic acid, obtained by the oxidation of methyl, ethyl, etc., pyridine, and from nicotine.

**Nictitating Membrane.** Third eyelid, seen at the inner canthus of the eye in birds, amphibians, and some other animals. It is not a true eyelid, but a semi-transparent fold of skin, which can be drawn over the cornea for its protection.

**Nicuesa,** DIEGO DE, b. ab.1465. Spanish commander, who was agent for the colonists in Spain.

**Nidamental Glands.** Organs that secrete a glutinous material to form protective cases for eggs, as in certain Mollusks. In the male the secretion aids in forming a spermatophore.

**Nidification.** Nest-building.

**Nidularieæ.** Family of *Fungi*, of the sub-class *Basidiomycetes*, including the Bird's-Nest Fungus and numerous other species.

**Nidus.** Suitable soil for the germination of a seed or spore.

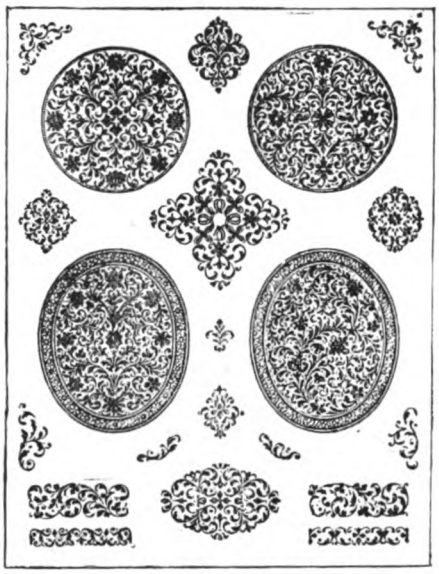
**Niebelungen.** See NIBELUNGEN.

**Niebuhr,** BARTHOLD GEORG, 1776–1831. Historian, b. in Copenhagen, settled in Berlin 1806; Prussian Minister to Rome 1816–22; prof. Bonn from 1822. His *Roman History*, 1811–32, extends only to 200 B.C., but is of the highest importance.—His father, KARSTEN, 1733–1815, was a Danish explorer in Asia 1761–67, and pub. *Arabia*, 1777–78.

**Niedner,** CHRISTIAN WILHELM, D.D., 1797–1865. Prof. at Leipzig and Berlin. *Ch. History*, 1846.

**Niel,** ADOLPHE, 1802–1869. French officer, distinguished in Algeria, the Crimea, and Italy; Marshal 1859; Minister of War 1867.

**Niello-Work.** Ornamental engraving of metal plates, the lines being filled with a black composition: practiced chiefly by Byzantines, Italians, and Russians. The plates so orna-



Niello-Work, 17th century.

mented were principally employed in the making of church plate reliquaries, and for costly personal ornaments. It is still practiced by goldsmiths in Russia.

**Niemann,** ALBERT, b. 1831. German opera tenor, now retired; the original *Siegmund* of the first Wagner festival at Bayreuth 1876; member of the Metropolitan Opera Company in New York 1886–88.

**Niemcewicz,** JULIAN URSIN, 1757–1841. Polish poet, dramatist, and novelist.

**Niemen.** See MEMEL.

**Niepce,** JOSEPH NICÉPHORE, 1765–1833. French soldier and chemist, associated with Daguerre in the studies and inventions which led to the photographic art.—His nephew, CLAUDE NIEPCE DE ST. VICTOR, 1805–1870, pub. two books on photography 1855–56.

**Nietzsche,** FRIEDRICH, b. 1844. German philosopher and critic of the destructive school; prof. at Basel 1869; now mentally dead. His works are being edited (1896) by A. Tille in 12 vols.; their standpoint is similar to Nordau's. *Case of Wagner*, tr. 1896; *Thus Spake Zarathustra*, tr. 1896.

**Nieuwveld Mts.** Range of mountains in Cape Colony. Alt. 7,000 ft.

**Nievo,** IPPOLITO, 1832–1861. Italian novelist and poet.

**Niffer.** City in Central Babylonia, recently excavated in part by an American expedition. The principal mound in its ruins covers the Temple of Bêl, presumably the oldest sanctuary in Babylonia. The remains of the city of King Sargon I., 4200 B.C., have been discovered, beneath which another city is being disinterred, which carries back recorded history to 4200–4800 B.C.

**Niflheim.** In Norse Mythology, region of cold and eternal night; governed by Hela, and consisting of 9 worlds.

**Niger.** River of n. Africa. Rises in the Kong Mountains, flows n.e. to the borders of Sahara, then turns s.e., and finally s., emptying into the Gulf of Guinea. Length ab. 2,500 m.

**Niger Territories.** British possessions in W. Africa, all territories with the exception of the Niger Coast Protectorate.

The governing power is mainly vested in the Royal Niger Co., to which a charter was granted 1886. Area ab. 500,000 sq. m. Pop. ab. 30,000,000.

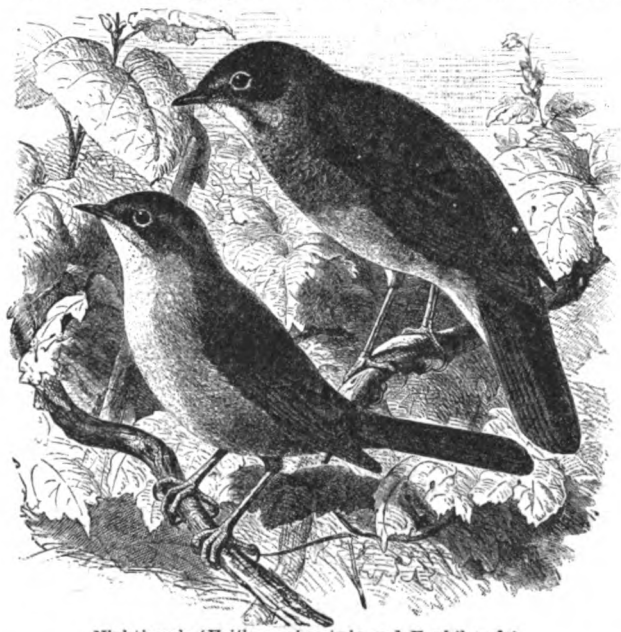
**Nigger Baby,** or HOLE BALL. Playground game, in some localities called also Cap Ball. In this case the players' caps are used instead of holes. Usually each player has a small hole dug in the ground, of sufficient size to hold the ball. One of them stands behind a mark and tosses or rolls the ball toward the caps or holes. He into whose hole the ball goes and lodges must seize it and throw it at one of the others. If he hits him, that player drops a stone in his hole and then takes his turn at rolling. If the thrower misses, he puts a stone in his own hole and then rolls. Each player has five stones; the one who gets five in his hole first is obliged to bend over, with his head to the wall, and allow each of the other players to take three throws at him with the ball.

**Night.** Greek goddess who by means of sleep exercised power over men and gods. See DAY.

**Night Blindness.** See NYCTELOPIA.

**Night-Hawk.** Bird of the Goatsucker family, having a wide gape, with small rictal bristles and long-pointed wings. It catches insects flying at dusk. The common American species, *Chordeiles virginianus*, ab. 9½ in. long, including tail 5 in., is brown, with white bars below. It utters a peculiar cry, and is known as the Night-Jar. See GOATSUCKER.

**Nightingale.** Two species are known in Europe, but related species live in n. Asia and in Central America. *Luscinia* is dull-brown above, grayish beneath, graceful in form, lives



Nightingale (*Erithacus luscinia* and *E. philomela*).

secreted in the brush by day, and utters a melancholy note. In England the male sings from April 15 to June 15. Its song, often praised by poets, is heard by night as well as by day. See DENTIROSTRES.

**Nightingale,** FLORENCE, b. 1823. English nurse, famous for her services at Constantinople and in the Crimean hospitals 1854–56; celebrated by Longfellow as *Santa Filomena*. *Notes on Nursing*, 1858; *Life or Death in India*, 1873.

**Night-Jar.** See NIGHT-HAWK.

**Nightmare.** Feeling of great distress during a disturbed sleep, attended with fright, hideous dreams, and often an inability to move or speak. It is frequently associated with faulty digestion.

**Nightshade.** *Solanum nigrum*. White-flowered herb of the natural family *Solanaceæ*, native of Europe, introduced as a weed into N. America.

**Nightshade,** DEADLY. *Atropa belladonna*. Lurid plant of the Potato family, native of Europe. See BELLADONNA.

**Nightshade,** ENCHANTER'S. *Circæa lutetiana*. Innocuous herb of the natural family *Onagraceæ*, native of woods in the n. hemisphere.

**Nightshade,** THREE-LEAVED. Showy-flowered herbs of the genus *Trillium*, natural family *Liliaceæ*, natives of the n. temperate zone, abundant in N. America.

**Nigidius Figulus,** PUBLIUS, d. 45 B.C. Roman writer, especially on grammar.

**Nigrosine.** See INDULINE.

**Nihilism.** Properly, the denial of all reality; in popular acceptance, a school which endeavors, on this basis, to overthrow all civil, religious, social, moral, and intellectual order; prevalent chiefly in Russia, where despotism drives thinking men to extremes of opinion and conduct. Many who are loosely classed as nihilists simply desire comparative liberty and a constitution. The term was first used by Turgenev in *Fathers and Sons*, 1862. The movement originated ab. 1840 in the Universities, became more socialistic after 1855 under the influence of the *Contemporary* magazine, and in 1870 entered its latest and most radical phase.

**Niigata.** Port of w. Japan, at the mouth of the Shinano, with a poor harbor. Pop., 1889, 40,778.

**Nijni-Novgorod.** City of central Russia, at the junction of the Oka and Volga; it is noted for its annual fair, held in Aug. and Sept., of the greatest importance in Russia; the goods brought there amount to ab. $120,000,000. The crops of the

Nijni-Novgorod, from the right bank of the Oka.

year being known and the production of cotton goods and iron, the prices for the tea and raw cotton imported from Asia, as well as for the Russian products, are determined. The total business transacted amounts to $200,000,000. Pop., 1890, 73,033.

**Nijni-Tagilsk.** Mining town of e. Russia, in the Ural Mts. Pop. ab. 40,000.

**Nikko.** Village of central Japan, 80 m. n. of Tokio; noted for its fine temples.

**Nikola I.,** b. 1841. Prince of Montenegro since 1860; poet and dramatist.

**Nikolaieff.** See NICOLAIEV.

**Nikon,** 1605–1681. Patriarch of Moscow 1652–66. His revision of the service-books led to his deposition and to the secession of the Raskolniks or Old Believers.

**Nile.** River of n.e. Africa. It heads in two main branches, the White and Blue Nile, of which the first is much the largest

The Nile.—The First Cataract, looking down the river toward Assouan.

and longest. Its source is in the great group of lakes in central Africa, of which Victoria Nyanza is the largest; thence it

flows n. The other branch heads in the high mountains of Abyssinia and flows n.w. to the main stream. The sources of these streams are in well-watered, fertile regions: the lower course is through the deserts of lower Soudan and Egypt. Its origin and sudden increase were long a mystery, though early geographers affirmed that it took its rise in great lakes to the s., a view recently established by the discoveries of Speke, Baker, and Stanley. It receives no tributaries of importance in the last 1,400 m. of its course. It enters the sea by two channels, inclosing a delta whose apex is at Cairo, 100 m. from the sea, and whose base measures 150 m. Anciently it had seven mouths. In Egypt the rise of the water begins June 25, and continues three months, reaching 40 ft. at Thebes. An excessive rise causes great loss of crops and property, sometimes of human life. The failure of a few feet means scarcity for the ensuing year. An effort is now making to control the flow of the river to some extent by the creation of vast storage-basins, to supply the needs of the valley in time of low water. Length ab. 4,300 m., drainage area 500,000 sq. m., discharge 130,000 cubic feet per second. See ALBERT NYANZA and VICTORIA NYANZA.

**Nile,** BATTLE OF THE (or ABOUKIR). Aug. 1, 1798, between a French fleet under Brueys and a British under Nelson. Two only of the 13 French ships escaped. The French admiral's ship blew up with 1,000 men on board.

**Nilfactor.** In higher Algebra, expression which, used as a factor, either faciend or facient, in certain combinations gives a product which vanishes.

**Nilometer.** Vertical graduated stone column, marking the rise and fall of the Nile.

**Nilpotent.** Expression which vanishes when raised to the second or any higher power.

**Nilsson,** CHRISTINE, b. 1843. Swedish prima-donna, who first appeared 1864 in Paris, made tours in America 1870–72 and 1883–84, was married to Auguste Rouzand 1872, and to Count Caza di Miranda 1887.

**Nilsson,** SVEN, 1787–1887. Prof. Lund 1832–56; writer on Scandinavian fauna and antiquities.

**Nimble Will.** *Muhlenbergia diffusa.* Grass, native of e. N. America.

**Nimbus.** See CLOUDS.

**Nimbus.** In Art, disk or circle surrounding the head in pictures and statues of the Saints, Virgin, and Saviour. There are anticipations of this halo in Pagan antiquity, as in a Juno bust in Naples. It also occurs in Hindu and Buddhist art.

**Nimeguen,** or NYMWEGEN. Town of Gelderland, Netherlands, on the Waal; scene of a peace congress 1678–79, when treaties were made between Louis XIV. and the allied powers. Pop., 1892, 34,128.

**Nimes.** City of s. France, 80 m. w.n.w. of Marseilles; anciently Nemausus; occupied by Romans 121 B.C., and long important; taken by Visigoths 465, Franks 507, and Saracens 725. By 1558 three-fourths of the inhabitants were Protestants, and the city suffered much during the religious wars, particularly in 1685, 1791, and 1815. It has large manufactures of silk. Pop., 1891, 71,623.

**Nimrod.** In Genesis, described as founder of the Babylonian dominion, which he extended over Assyria, and as a mighty hunter. The later traditions of his godlessness and violence have no basis.

**Nimroud,** or KALAH. Assyrian city, on the Tigris, founded ab. 1320 B.C.; excavated by Layard 1845 and later. It yielded many important reliefs and inscriptions.

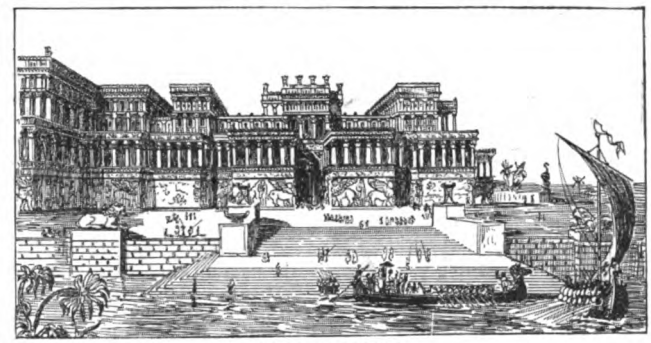
**Nine-Bark.** *Physocarpa opulifolia.* White-flowered shrub of the Rose family, native of e. N. America.

**Nine Men's Morris.** See MERELLES.

**Ninepins.** See BOWLS.

**Nines,** THEORY OF. The number nine has peculiar properties, which enable it to be used to verify computations. The remainder after dividing any number by nine is the same as that after dividing the sum of its digits by nine: the remainder in either case is called the excess of nines. Computations are verified by comparing the excess of nines in the numbers used with that of the result.

**Nineveh.** Capital of the Assyrian monarchy; on the Tigris. It was an important city as early as 1800 B.C. Sargon, 722–705, did much to adorn it. Sennacherib, his son, 705–681, raised it to the highest pitch of splendor. Its most famous works of art were executed under Assurbanipal (Sardanapalus) 668–626. It was taken by the Medes and Babylonians after two years' siege between 626 and 608. The walls are described as 100 ft. high and thick enough to allow 3 chariots abreast upon them, with 1,500 towers 200 ft. high. Ctesias makes the city 480 stadia (55 m.) in circuit, but seems to have included a group of cities. Excavations, centering in the modern site of Kouyunjik, made after 1840 by Layard and others, brought to light



Palace at Nineveh.

4 temples, 5 palaces, and parts of the city walls, with massive sculptures, numerous tablets and inscriptions, and remains of the library of Sardanapalus. Many of these are now in the British Museum and the Louvre. See ASSYRIAN ART, BOTTA and LAYARD.

**Ningpo.** City of China, on the left bank of the N. River, 16 m. from its mouth. It has a large foreign trade and considerable manufactures, especially of silk and cotton. Pop. ab. 250,000.

**Ninian,** ST., ab. 360–432. Apostle of the Picts, in s. Scotland.

**Nino,** PEDRO ALONZO, b. ab.1455. Portuguese navigator with Columbus on his third voyage, 1498.

**Ninon de l'Enclos.** See L'ENCLOS.

**Niobe.** Daughter of Tantalus and wife of Amphion. Because of her 12 sons and daughters, she exulted over Latona, who had borne only Apollo and Diana: for this her children were slain with arrows, and she changed into a stone. The famous group of statues was found at Rome 1583, and is in the Uffizi at Florence.

**Niobium.** H. Rose in 1846 isolated two oxides from columbite, thought by him to be of two elements, which he named niobium and pelopium after Niobe and Pelops, the children of Tantalus, after whom tantalum was so called, the three always being found associated. It was subsequently found that the two oxides were from the same element, which was discovered by Hatchett in 1801 and named by him COLUMBIUM (q.v.).

**Niobium Dioxide.** $Nb_2O_2$. Black powder, sp. gr. 6.3, or lustrous regular crystals; soluble in hydrochloric acid; obtained by heating magnesium wire and passing over it the vapor of niobium oxychloride.

**Niobium Pentabromide.** $NbBr_5$. Purple-red volatile substance, made in the same way as niobium pentachloride.

**Niobium Pentachloride.** $NbCl_5$. Yellow needles, mpt. 194° C.; soluble in hydrochloric acid; made by heating a mixture of the pentoxide and carbon in a current of air and moisture-free chlorine.

**Niobium Pentafluoride.** $Nb.Fl_5$. Made by dissolving the pentoxide in hydrofluoric acid. The solution will not deposit crystals.

**Niobium Pentoxide.** $Nb_2O_5$. White, amorphous, non-volatile powder, made by heating the dioxide in the air.

**Niobium Tetroxide.** $Nb_2O_4$. Black or blue powder, not attacked by the common acids; obtained by passing hydrogen over the pentoxide at a white heat for several hours.

**Niobium Trichloride.** $NbCl_3$. Crystal crusts or long needles, non-volatile, insoluble in water; made by passing the vapor of the pentachloride through a red-hot tube.

**Niobrara.** River of n. Nebraska, rising in e. Wyoming and flowing e. to the Missouri. Length 450 m.

**Nipissing.** Canadian lake near the n.e. side of Lake Huron, and drains into Georgian Bay by French River. Length 50 m., breadth 15 m.

**Nipperdey,** KARL LUDWIG, 1821–1875. Prof. Jena 1852; ed. Tacitus, Cæsar, and Nepos.

**Nipple.** The conical projection at the summit of the female breast or mamma through which the milk is drawn; the mammilla. It is surrounded by the areola.

**Nipple-Wort.** *Lapsana communis.* Yellow-flowered herb of the Composite family, native of Europe, introduced as a weed into waste places in N. America.

Nipple-Wort (*Lapsana communis*)

**Nippon.** Largest of the islands forming the Empire of Japan. Its surface is broken and mountainous. N., now used even in official publications as one of the names of the main island, is properly that of the whole empire. Area 87,482 sq. m.; pop., 1892, 31,246,309.

**Nirvana.** Buddhist ideal of perfection, attained by Gautama during life, but supposed to be now unattainable. Whether it implied personal immortality or absorption into the Infinite is disputed. See BUDDHISM.

**Nisard,** JEAN MARIE NAPOLÉON DÉSIRÉ, 1806–1888. Prof. Coll. de France 1843; Academician 1850. *Hist. de la littérature Francaise*, 4 vols., 1844–61; *Etudes*, 1859–64–75; *Renaissance et Réforme*, 1877.

**Nisibis.** City of n. Mesopotamia, held by Romans 165–363.

**Nisi Prius.** Common-law trial court for issues of fact, consisting of a judge and jury.

**Nissa,** or NISCH. Ancient town of s. Servia, on the Nissava. Near it the Turks were defeated by Sigismund of Hungary 1419, and by Austrians 1689. Pop., 1893, 19,877.

**Nissen,** HEINRICH, b. 1839. Prof. Marburg 1869, Strassburg 1878, and Bonn 1884; writer on classical antiquities.

**Nitelleæ.** Family of *Characeæ*, in which the corona of the oögonium consists of 10 cells.

**Niter.** $KNO_3$. SALTPETER, or POTASSIUM NITRATE (q.v.). It is found occasionally as a natural mineral in the soils of hot regions, as Bengal, Spain, Egypt, and Persia, where it is formed, after a season of rain, by the reactions between the products of decomposition of organic matter and of feldspathic rocks. See NITRIFICATION.

**Niter-Bush.** Thorny shrubs of the genus *Nitraria*, natural order *Zygophyllaceæ*, natives of Asia and Africa, bearing sweet fruits the size of a gooseberry.

**Nith.** Beautiful Scottish river, flowing s.e. through the district of Nithsdale for ab. 60 m., and emptying by an estuary 5 m. wide into Solway Firth.

**Nithsdale,** WILLIAM MAXWELL, EARL OF, 1676–1744. Jacobite lord, condemned after the rising of 1715; delivered from the Tower of London by his wife, who changed clothes with him.

**Nitocris.** Queen of the sixth Egyptian dynasty, celebrated by Herodotus.

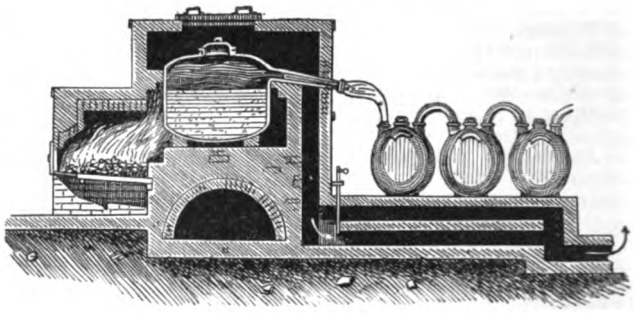
**Nitranilic Acid.** $C_6(NO_2)_2O_2(OH)_2$. Golden yellow needles, soluble in water; detonating at 170° C. without melting; made by the action of sodium nitrite upon chloranil.

**Nitranilines.** $C_6H_4{:}NH_2{,}NO_2$. Nitroamidobenzene, known in three forms, ortho, meta and para; beautiful yellow crystalline substances. The ortho and para compounds are prepared from the product of the action of nitric acid upon acetanilide. The meta compound is prepared by the action of hydrogen upon metadinitro benzene; mpt. 114° C. The ortho compound, melts at 71.5° C., the para at 147° C.

**Nitrates.** Salts of nitric acid.

**Nitrian Desert.** See NATRON LAKES.

**Nitric Acid** (AQUA FORTIS). $HNO_3$. Clear, colorless, strongly corrosive liquid, with marked acid taste and reaction; known since the ninth century. It was made by distilling saltpeter, copper sulphate and alum together. It occurs in nature only in the form of salts, especially sodium, potassium, and calcium nitrates: rarely it is present in the air as the ammonium salt. The nitric acid of commerce is made by heating Chili saltpeter (sodium nitrate), with sulphuric acid in retorts; nitric acid is formed and distills over, and sodium sulphate remains in the still. It mixes in all proportions with water. Concentrated acid has sp. gr. of 1.42 and contains 68 per cent $HNO_3$: if this acid is distilled slowly with sulphuric acid and carbon dioxide passed through the distillate, an acid containing 99.5 per cent $HNO_3$ may be obtained. It is a powerful oxidizing agent and solvent, dissolving almost all metals excepting gold



Nitric acid apparatus.

and platinum; it destroys many coloring substances. It is used for a variety of purposes, in making dyes, explosives, etc. Red fuming nitric acid has sp.gr. 1.6, and contains a large proportion of nitrogen dioxide. It is much more powerful in its action than the ordinary form, and must be handled with extreme caution.

**Nitric Ether.** See ETHYL NITRATE.

**Nitric Oxide.** $N_2O_2$, or NO. Colorless gas, sp.gr. 1.038, slightly soluble in water, readily soluble in solutions of ferrous salts. It is liquefied at —93° C., 71 atm.; solid at —167° C. When it is allowed to escape in the air it forms a reddish brown gas, $NO_2$. It is made by treating copper with nitric acid. It was discovered by Priestley.

**Nitrides.** Compounds composed of nitrogen and some other element; *e.g.*, boron nitride, BN.

**Nitrification.** Process by which the nitrogen of the atmosphere or organic material in the soil or of ammonia compounds is turned into nitric acid. This is induced by certain microbes. Artificial beds of rich soil, manure, wood ashes and lime are watered with urine for the production of niter; in Bengal the niter beds are made in the rich soils of the Ganges. A certain degree of heat, moisture, and a base to take up the acid are necessary.

**Nitriles.** Organic cyanides; compound in which the oxygen and hydroxyl of carboxyl are replaced by nitrogen. Thus from acetic acid, $CH_3COOH$, is derived $CH_3CN$, acetonitrile, which is also methyl cyanide. They are made by dehydrating the ammonium salt of carbonic acids, or by treating a hydrocarbon halogen substitution product with silver cyanide, and converted into the corresponding acids by boiling with alkalies.

**Nitrites.** Salts of nitrous acid.

**Nitroalizarin.** See ALIZARIN ORANGE.

**Nitrobenzene.** $C_6H_5.NO_2$. Product of the action of strong nitric acid upon benzene; yellowish oil, boiling at 206° C., and possessing a bitter-almond-oil odor. It is the source for aniline, which is prepared from it by the action of iron and acetic or hydrochloric acid. It is used as a perfume in soap-making. Bellite, 1 part trinitrobenzene, with 2.5 parts of ammonium nitrate, and securite, 1 part ammonium nitrate and 20 parts dinitrobenzene, are powerful explosives.

**Nitro Cellulose.** By the action of nitric acid, cellulose is changed into a series of nitrates varying in composition with the strength of the acid. Gun-cotton is the so-called hexanitrate, and is a very powerful explosive, prepared by the action of nitric and sulphuric acids on cotton fiber. The di- and tri-nitrates are less explosive, and are used in the preparation of celluloid and collodion. Gun-cotton does not differ in appearance from ordinary cotton. It is 5 times as effective as blasting powder. It ignites at 130° C., may be detonated by heat or shock, and produces 860 l. of gas per kg. It was made by Pelouze 1838 and by Schönbein 1845 as an explosive. See SMOKELESS POWDERS.

**Nitrocinnamic Acid,** ORTHO. $C_6H_4{:}NO_2.CH{:}CH.COOH$. Prepared by the action of nitric acid upon cinnamic acid. The para acid is also formed, but is less soluble in alcohol, thus affording a means for separation. It is closely related to indigo, and used for the artificial preparation of the same.

**Nitro Compounds.** Organic compounds containing a nitro ($.NO_2$) group united to a carbon atom. $CH_3NO_2$, nitro methane; $C_6H_5.NO_2$, nitro benzene. In these compounds the

nitrogen joins the oxygen to the carbon. They are made by treating organic compounds with nitric acid.

**Nitrogelatin.** This is a mixture of nitroglycerin and 3 to 8 per cent of gun-cotton, invented by Nobel 1879. It is more effective than nitroglycerin, 3 times as effective as blasting powder, and 50 per cent more disruptive than dynamite. It freezes at 4.5° C. and is not affected by water. Gelatin dynamite contains 65 per cent nitrogelatin mixed with niter 26, woodmeal 18, and sodium carbonate 1. Forcite contains 44 per cent nitrogelatin mixed with sodium nitrate 50, woodmeal 2, sulphur 4.

**Nitrogen.** N. At.wt. 14.03, sp.gr. .9701, sp.ht. .243, valence III. V. Discovered by Rutherford 1772: colorless, odorless, tasteless gas, forming $\frac{4}{5}$ of the atmosphere. Chemically it is extremely inactive, uniting directly with but few of the other elements. Water dissolves $1\frac{1}{2}$ per cent by volume. It does not support respiration or combustion. It occurs in large quantities in $KNO_3$ and $NaNO_3$. The most convenient way to obtain it is to remove the oxygen from air in a closed vessel by burning phosphorus; the contents of the vessel are then passed through caustic potash, and the gas is obtained fairly pure. Another method, yielding a purer product, is by heating ammonium nitrite. It is liquefied at —124° C., 42 atm.; sp.gr. liquid .885.

**Nitrogen Bromide.** $NBr_3$? Violently explosive, dark-red, heavy, oily liquid, made by adding an aqueous solution of potassium bromide to nitrogen trichloride under water.

**Nitrogen Dioxide,** or NITROGEN PEROXIDE. $N_2O_4$, or $NO_2$., sp.gr. 1.04. Water absorbs 5 per cent by volume; ferrous sulphate solutions absorb it freely, forming a brown solution. Reddish-brown gas, made by passing air into nitric oxide. It condenses readily to a yellow liquid at 22° C.; at —10° C. it forms white crystals.

**Nitrogen-Free Extract.** In fodders, substances containing no nitrogen, and soluble in dilute acids and alkalies. The most important are sugar, starch, gum and pectin bodies. It is determined by subtracting, from the total dry matter, the protein, fiber, fat and ash. Most fodders, particularly coarse ones, have a superabundance of these substances for the needs of the animal. In fact, an important problem of cattle-feeding is to supply in concentrated fodders enough of protein, so that the nitrogen-free extract of the coarse fodders may be economically used up.

**Nitrogen Pentoxide,** or NITRIC ANHYDRIDE. $N_2O_5$. Anhydride of nitric acid; colorless rhombic prisms, melting at 30° C., boiling at 45° C., very unstable, and sometimes exploding spontaneously; made by treating silver nitrate with chlorine; strong oxidizing agent.

**Nitrogen Peroxide.** See NITROGEN DIOXIDE.

**Nitrogen Sulphide.** $N_2S_2$. Golden-yellow, or reddish-yellow, transparent rhombic crystals; mpt. 158° C.; sublimes at 135° C., decomposes and detonates at 160° C.; soluble in carbon bisulphide; made by the action of ammonia upon sulphur dichloride; very explosive.

**Nitrogen Sulphuric Acid.** $N(SO_3H)_3$. The potassium salt consists of long, thin needles of a silky luster, made by bringing together potassium sulphite and nitrite, and allowing the mixture to stand

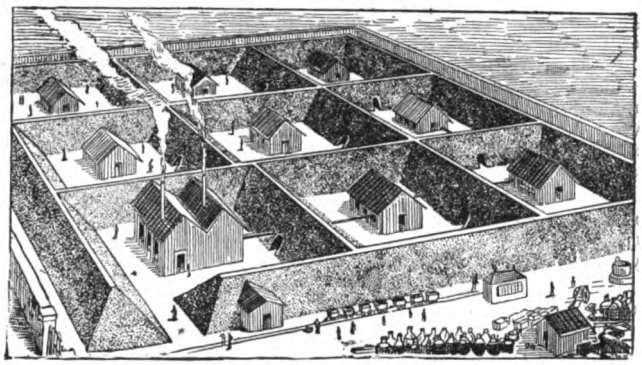
**Nitrogen Trichloride.** $NCl_3$. Extremely explosive oil, made by the action of chlorine on ammonia. Direct sunlight causes it to explode. Very similar to this compound is nitrogen triiodide, $NI_3$, made by pouring concentrated ammonia over iodine.

**Nitrogen Triiodide.** See NITROGEN TRICHLORIDE.

**Nitrogen Trioxide,** or NITROUS ANHYDRIDE. $N_2O_3$. Anhydride of nitrous acid; dark-blue liquid boiling at 3.5° C., with partial decomposition into nitric oxide and peroxide; made by treating starch or arsenic trioxide with nitric acid. The gas thus obtained can be easily condensed to the liquid form at —14.4° C.; sp.gr. 1.45.

**Nitroglucose.** Modern explosive, consisting of glucose, potassium nitrate, potassium chlorate, and vegetable fiber.

**Nitroglycerin.** $C_3H_5(NO_3)_3$. Discovered at Paris in 1847 by Sobrero, and brought into practical use as an explosive agent by Nobel 1863. Sobrero's process for its manufacture is to pour one part by weight of anhydrous glycerin with constant stirring into a mixture of four parts of concentrated sulphuric acid (sp. gr. 1.845) and two parts of fuming nitric acid (sp. gr. 1.52), the temperature of the mixture being kept below 24° C. by external cooling with ice. After the oily drops have formed on the surface, the mixture is poured, with constant stirring, into 100 parts of cold water: 45 lbs. acid produce 13 lbs. nitroglycerin. It is a colorless, oily liquid, having a sp. gr. of 1.6, and insoluble in water. It burns without exploding, but is easily exploded by concussion, and is about eight times as powerful an explosive as gunpowder, weight for weight: it is fired by detonators of mercury fulminate. It explodes at 185° C., and is used in chambering petroleum oil wells; otherwise as an explosive only in mixtures. By mixing



General View of the Nitroglycerin Works at Cengio, Italy.

nitroglycerin with some active or inert base as an absorbent, dynamite is formed, which can be more freely handled and better transported than nitroglycerin. See DYNAMITE, EXPLOSIVES and PYROXYLIN.

**Nitrohydrochloric Acid.** See AQUA REGIA.

**Nitromethane.** $CH_3.NO_2$. Bpt. 101° C.; liquid formed by the action of silver nitrite on methyl iodide. By reduction with hydrogen it furnishes methylamine.

**Nitronaphthalene.** $C_{10}H_7.NO_2$. First product of the action of strong nitric acid upon naphthalene; yellow crystalline body, melting at 61° C., and furnishing $\alpha$-naphthylamine when treated with hydrogen.

**Nitronaphthol.** The commercial product is a dinitro compound. See DINITRONAPHTHOL.

**Nitrophenols.** $C_6H_4:NO_2.OH$. By the action of cold dilute nitric acid upon phenol, ortho- and paranitrophenols are formed. If the acid is strong, picric acid is formed. Orthonitrophenol forms yellow prisms with a strong odor, volatile with steam, mpt. 45°, bpt. 214° C. Metanitrophenol is made from metanitraniline; yellow crystals, mpt. 96° C. Paranitrophenol forms long colorless needles, mpt. 114° C.

**Nitrophenylpropriolic Acid,** ORTHO. $C_6H_4:NO_2.C:C.COOH$. Prepared from nitrocinnamic acid by the addition of bromine and subsequent treatment with potash. Reducing agents change it to indigotine; hence it is sold for the artificial production of indigo blue.

**Nitroprussiates.** The sodium salt $Na_2Fe(CN)_5NO+2H_2O$ is used in the laboratory as a test for sulphides, with which (except hydrogen sulphide) it gives an intensely violet solution. It is made by treating potassium ferrocyanide with nitric acid, removing the potassium nitrate thus formed, and neutralizing with sodium carbonate.

**Nitrosoamines.** Compounds formed from the so-called secondary bases, in which two atoms of hydrogen in ammonia have been replaced by radicals, by the action of nitrous acid. So methylaniline forms with nitrous acid nitrosomethylaniline, $C_6H_5.CH_3:N.NO$.

**Nitroso Compounds.** Compounds containing an NO group. Example, $NO.C_6H_4N(CH_3)_2$, nitrosodimethylaniline.

**Nitrosodimethylaniline.** $C_6H_4:NO.N(CH_3)_2$. Substance crystallizing in beautiful green plates, which melt at 85° C., produced by the action of nitrous acid upon dimethylaniline; used in the manufacture of artificial dye stuffs.

**Nitrosulphonic Acid.** $NO_2.SO_2.OH$. Usually a feathery or leafy crystalline mass, sometimes four-sided or rhombic columns; mpt. 73° C.; formed in the manufacture of SULPHURIC ACID (q.v.); made by passing sulphur dioxide into well-cooled, fuming nitric acid.

**Nitrosyl Bromide.** NOBr. Brownish-black liquid; bpt. —2° C.; made by passing nitric oxide into bromine cooled from —7° to —15° C.

**Nitrosyl Chloride.** NOCl. Yellowish-red liquid; bpt. —5° C. It forms double salts with metallic chlorides, and is obtained from aqua regia by gentle distillation.

**Nitrosylsulphuric Acid.** See SULPHURIC ACID.

**Nitrotoluenes.** $C_6H_4:CH_3,NO_2$. The ortho- and paranitrotoluenes are prepared from toluene exactly as nitrobenzene is prepared from benzene. They furnish by reduction the toluidines of commerce. The ortho compound is a liquid, the para is a solid. See NITROBENZENE.

**Nitrous Acid.** $HNO_2$. Acid unknown, but the metallic derivatives, the nitrites, are well-characterized compounds. See POTASSIUM and SILVER NITRITES.

**Nitrous Ether.** See ETHYL NITRITE.

**Nitrous Oxide,** or LAUGHING GAS. $N_2O$. Sp.gr. 1.527. Colorless gas, with a sweetish taste and odor; soluble in water. It supports combustion almost as well as oxygen, can be easily liquefied at 0° C., 30 atm.; sp. gr. of liquid .90, and is put on the market in this form in metallic cylinders. It is made by heating ammonium nitrate. If inhaled, it causes unconsciousness and insensibility to pain, hence it is used in minor surgical operations. Its anæsthetic properties were discovered by Sir Humphrey Davy 1800. It was first used in extraction of teeth by Horace Wells, of Hartford, Conn., Dec. 1844. The gas was discovered by Priestley 1776.

**Nitroxylenes.** $C_6H_3(CH_3)_2NO_2$. Compounds formed by the action of strong nitric acid upon the xylenes. Some are liquids, some solids. They are used in the manufacture of the xylidines, and are similar to the NITROTOLUENES (q.v.).

**Nitryl Bromide.** $NO_2Br$. Preparation and properties similar to NITRYL CHLORIDE (q.v.).

**Nitryl Chloride.** $NO_2Cl$. Bpt. 5° C. Faintly-yellow liquid. With water it forms nitric and hydrochloric acids. It is made by heating nitrogen dioxide and chlorine together at high temperatures.

**Nitschmann,** 1696–1772. Moravian bishop, active in travel and mission work. He was in America 1735–36, with J. and C. Wesley; 1740–41, when he founded Bethlehem, Pa.; and from 1755.

**Nitzsch,** KARL IMMANUEL, D.D., 1787–1868. Prof. Bonn 1822, Berlin 1847. *System of Doctrine*, 1829, tr. 1849; *Practical Theology*, 1847–67.—His son, FRIEDRICH AUGUST BERTHOLD, b. 1832, prof. at Kiel since 1872, has pub. *Boethius*, 1860; *Hist. Doctrine*, 1870; *Luther and Aristotle*, 1883.—Karl's brother, GREGOR WILHELM, 1790–1861, prof. at Kiel 1827 and Leipzig 1852, wrote much on Homer and Greek poetry.—His son, KARL WILHELM, 1818–1880, prof. at Kiel, Königsberg, and Berlin, wrote on the classics and on German history.

**Niu-chwang.** See NEW-CHWANG.

**Nivenite.** Variety of the mineral URANINITE (q.v.).

**Nix,** or NIXIE. Teutonic water-spirit, able to assume any shape; generally malign.

**Niza,** MARCOS DE, ab.1495–1542. Missionary in Peru 1532, and Mexico 1535. He traveled to the pueblos of New Mexico, and made a false report of their wealth.

**Nizami,** 1141–1203. Persian epic poet, whose voluminous writings show great power in description and in the delineation of character. He was only surpassed by Firdausi.

**Nizam's Dominions.** Territory in the interior of Southern India containing 82,698 sq.m. It owes its name to the title conferred on the nobleman who afterward became the first ruler of the present dynasty. The ruler is called the Nizam. The capital is HYDERABAD (q.v.). Pop., 1891, 11,537. See DIAMOND.

Egyptian, in the Nizam Dress.

**Njord.** In Norse Mythology, god of the winds, who calms the sea.

**No.** Dramatic performances of the higher Japanese, with music.

**Noah.** Ninth in descent from Adam; saved, with his family, in the Ark from the Flood.

**Noah,** MORDECAI MANUEL, 1785–1851. U. S. Consul-gen. at Tunis 1813–15; ed. N. Y. *Courier and Enquirer* and other papers; author of several plays. He attempted, 1825, to found a Jewish colony near Niagara Falls. *Travels*, 1819.

**Noah's Ark.** Polar bands and allied forms of cirrus clouds.

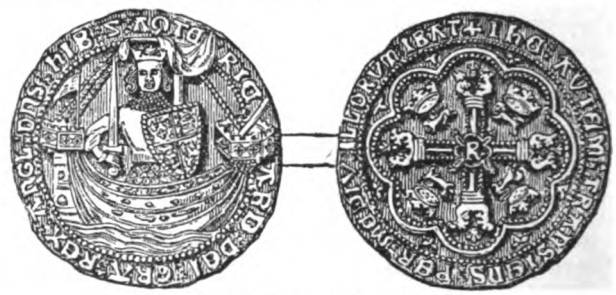
**Noah's Ark.** The gopher-wood ark in which Noah was saved forms the model of a common toy in Europe and America. Noah, his sons, and the various animals are represented carved in wood. Similar toys are common in different parts of the East, where they appear to have been used as aids in instructing children.

**Noailles,** LOUIS MARIE, VICOMTE DE, 1756–1804. French officer, in the U. S. 1779–82 and 1792–1802; killed in the W. Indies.—His grandfather, ADRIEN MAURICE, third Duke, 1678–1766, was a marshal.—PAUL FRANÇOIS, 1739–1824, fifth Duke, was a noted chemist.—PAUL, 1802–1885, sixth Duke, was a historian and Academician. Others of this family were eminent in war or diplomacy.

**No-Amon.** Thebes in Egypt; so called by Hebrew prophets.

**Nobili's Rings.** If a drop of acetate of copper or of lead be placed in a silver plate and the silver be touched in the middle of the drop by a piece of zinc, there will be formed around the point of contact a series of copper rings alternately dark and light. They may be obtained in beautiful iridescent colors by various electrolytic processes.

**Noble.** English gold coin ab. 1350; value ab. $1.65. The rose-noble, ab.1470, was worth $2.50. The coin was first used


Gold Noble of Richard II.

in the reign of Edward III., and is said to have derived its name from the excellence of the metal of which it was composed.

**Noble Metals.** Gold, silver, platinum, palladium, ruthenium, rhodium, iridium and osmium, which resist oxidation when exposed to the action of air and water.

**Nobunaga,** 1533–1582. Dainagon or ruler of Japan from 1574; in conflict with the Buddhist priests.

**Noctiluca.** See RHYNCHOFLAGELLATA.

**Noctuina.** Tribe of *Lepidoptera*, including forms which fly at night. They have a broad body tapering posteriorly, and dull-colored wings that are tectiform when at rest. The antennæ are long, bristle-like, and sometimes pectinate in the male. The caterpillars are naked, or hairy, with twelve to sixteen legs, and live mostly in the earth. Some injure fruit-trees.

**Nocturn.** An office, consisting of psalms and prayers, celebrated in the R. C. Church at midnight. It now forms a part of the service of MATINS (q.v.).

**Nocturne.** Musical composition whose origin is due to JOHN FIELD (q.v.). It is a dreamy composition, intended to embody sentiments appropriate to the evening or night. Chopin's are also popular.

**Nodal Line.** See NODE.

**Noddy** (ANOUS STOLIDUS). Sooty brown tern, remarkable for its stupidity. In some localities its eggs are used for food.

**Node,** or NODAL POINT. Point of least motion on a stretched string vibrating transversely in any whole number of parts. The parts between the nodes are called the antinodes, loops, or ventral segments. If the vibrating body be a plate, the nodes become nodal lines; if it be a rod or column of air vibrating longitudinally, the nodes are planes perpendicular to the column. See CHLADNI'S FIGURES.

**Node** (IN CURVES). Point where two or more branches of a curve coincide, having distinct tangents. If the tangents be both real, there is a crunode; if both imaginary, an acnode (= conjugate point). Two coincident nodes give a tacnode; three nodes coinciding so that the branches osculate are called an oscnode.

**Node of a Planet's Orbit.** Point where the orbit intersects the plane of the ecliptic. The line of the nodes is the line in which the plane of the orbit intersects the plane of the ecliptic.

**Nodes.** Joints or sections of vegetable stems, each commonly bearing one or more leaves.

**Nodical Month.** Time required for the moon to pass from one of its nodes to the same node again; viz., 27.21 days. As the node itself is in motion, this is less than the sidereal month.

**Nodier,** CHARLES, 1780–1844. French novelist and scientific writer, leader of the romanticists; Academician 1833. *Souvenirs de Jeunesse*, 1832.

**Nodule.** Rounded irregular-shaped lump or mass, often inclosing a fish, shell, or other fossil.—In Botany, thick points of the cell-wall of diatoms.

**Noe,** AMEDÉE DE. See CHAM.

**Noel,** BAPTIST WRIOTHESLEY, 1799–1873. Anglican divine till 1848, then a Baptist; eminent as preacher and philanthropist.—His son, HON. RODEN BERKELEY WRIOTHESLEY, 1834–1894, pub. *A Modern Faust*, 1888, and other poems.

**Noetians.** Patripassian or Monarchian sect, founded in Asia Minor and elsewhere by Noetus ab. 180. They identified Christ with the Father.

**Noises.** Sounds due to non-periodic vibrations of sonorous bodies; in distinction from musical sounds, which are caused by periodic vibrations. Subjectively, noises lack the pleasant quality which is characteristic of musical sounds. Practically, noises accompany all musical sounds, but often go unnoticed in the prominence of the periodicity. There have been attempts to classify noises, *e.g.*, into three categories, the beats accompanying musical sounds, cracking or crashing noises, and hissing sounds, it being held that these three varieties, mixed with musical sounds, make up all the noises of our experience.

**Nola.** Town of Campania, 15 m. n.e. of Naples; taken by Romans 313 B.C. Here Hannibal was thrice repulsed 216–214 B.C. Sulla was victorious 88 B.C., and Augustus died. Pop. ab. 7,500.

Coin of Nola

**Noldeke,** THEODOR. b 1836. Prof. at Kiel 1864 and Strassburg from 1872. He has pub. much on Syrian grammar and oriental history. He stands among the first in Arabic philosophy and Oriental history.

**Nolet de Brouwere van Steeland,** JOANNES CAROLUS HUBERTUS, b. 1815. Belgium author.

**Nolhac,** PIERRE DE, b. 1859. Prof. in Paris 1886; critic and literary antiquarian.

**Nollekens,** JOSEPH, 1737–1823. English sculptor, R.A. 1772.

**Nolle Prosequi.** Formal discontinuance of an action by the prosecutor.

**No Man's Land.** In S. Africa, s. of Natal; now East Griqualand.—Island in the Atlantic ocean, s. of Mass.

**Nom de Plume.** See PSEUDONYM.

**Nome.** Territorial division or district, especially of Egypt, under Greek and Roman rule.

**Nomenclature.** See ACID and SALTS.

**Nominalism.** Theory that general conceptions represent no reality other than mental, and are mere names of mental constructions from the empirical observation of qualities existing only in the individual.

**Nominal Wages.** Rate of remuneration which the laborer receives, expressed in money, irrespective of the amount of necessaries, comforts, and luxuries that this money will buy. The latter is known as Real Wages.

**Nominations.** For President and Vice-Pres., made by National Conventions 1832, and since 1840; for State officers, by State Conventions; for foreign ministers and some other officers, by Pres. to Senate; for department officers, by members of the Cabinet to the President.

**Nomsz,** JOHANNES, 1738–1803. Dutch dramatist, poet, and translator.

**Nonane.** $C_9H_{20}$. Bpt. 150° C. Liquid hydrocarbon. Petroleum contains two forms of nonane, perhaps more. It is present in commercial naphtha and illuminating oil.

**Non-Combatant.** One connected with the army, or one within its lines, but forming no part of its fighting strength, as surgeons, chaplains, etc., or citizens.

**Non-Commissioned Officers.** In U. S. service, in order of precedence: 1. Cadet (a warrant officer); 2. Sergeant-major (regimental); 3. Quartermaster-sergeant (regimental); 4. Ordnance, commissary, and post-quartermaster-sergeant, hospital steward, first-class sergeant of the Signal Corps, chief musician, principal musician, chief trumpeter, and saddler sergeant; 5. First sergeant; 6. Sergeant and acting hospital steward; 7. Corporal.

**Non-Competing Groups.** In Economics, groups into which industrial societies are divided: within each labor and capital move and compete freely, but each is completely shut off from the others.

**Non-Conductors of Heat.** Materials which can be used around hot objects (or cold ones) to prevent them from radiating or conducting their heat to surrounding objects, or absorbing heat from other objects. They retard the tendency to equalization of temperatures when two bodies of different amounts of heat are brought together. This matter is purely relative: the following table represents reliable experiments. It would seem that materials which occlude air in their interstices and prevent its circulation form some of the best non-conductors. Covering two inches thick:

| | | | |
|---|---|---|---|
| Hair Felt | 1.000 | Loam | 0.550 |
| Mineral Wool | 0.832 | Lime (slaked) | 0.480 |
| Sawdust | 0.680 | Asbestos | 0.363 |
| Charcoal | 0.632 | Ashes | 0.345 |
| Pinewood | 0.553 | Coke | 0.277 |
| Air Space | 0.136 | | |

**Nonconformists.** Originally, ministers ejected 1662 for refusing submission to the Act of Uniformity, as the Anglicans had been some years before under Puritan rule. In present usage, all Dissenters, *i.e.*, members of other Cummunions than the Ch. of England.

**Nondo.** See ANGELICO.

**Non-Electric.** See ELECTRIC.

**None-so-Pretty.** *Saxifraga umbrosa.* Showy-flowered herb of the natural family *Saxifragaceæ*, native of Europe, cultivated for ornament.

**Nonesuch.** See MEDICK.

**Non-Intercourse Act.** Measure substituted by U. S. Congress 1809 for the Embargo act of 1807, which had entirely prohibited foreign commerce. This prohibited foreign intercourse only with Great Britain, France, and their dependencies. In 1810 the law was annulled so far as it applied to France, and in 1811 for Great Britain. Both acts occasioned much dissatisfaction.

**Nonius,** MARCELLUS. Latin grammarian of 3d or 4th cent. His work is valued for its extracts from books now lost.

**Nonjurors.** Anglican bishops and clergymen who refused to take the oath of allegiance to William and Mary 1689, after the expulsion of James II., and were displaced; led by Abp. Sancroft.

**Non-Metals.** See METALS.

**Nonnerwerth.** Nun river-island. Village of Prussia on an island in the Rhine at the foot of the Drachenfels, 8½ m. s.e.

Drachenfels and the Island of Nonnerwerth.

of Bonn. The nunnery, founded early in the 12th cent., was abolished 1802. Pop. ab. 2,000.

**Nonnus,** probably 5th cent. Greek writer of a long epic in 48 books entitled *Dionysiaca* or *Bassaraca.* It is an ill-digested mythological poem of inferior style.

**Non-Palliata.** See NUDIBRANCHIATA.

**Non-placental Mammals.** See APLACENTALIA.

**Non Possumus.** Form of papal refusal; ascribed to Clement VII., ab. 1532, answering Henry VIII.

**Non-Resident.** Not a dweller within some jurisdiction mentioned; not an inhabitant of the State or town in question. The place of residence is wherever the person is entitled to exercise his political rights. See RESIDENCE.

**Non-Retinulate.** Eye having the cells of the retina not grouped into retinulæ. It is always monomeniscous, and may be either monostichous (eyes of larvæ) or diplostichous (ocelli of insects).

**Non-Suctoria.** Order of ACINETARIA (q.v.).

**Nonsuit.** Judgment that the plaintiff has failed to properly continue his suit. It is not generally on the merits nor a bar to another suit for the same cause.

**Nootha Sound.** Inlet on w. coast of Vancouver Island forming an excellent harbor. First discovered by Perez 1774; rediscovered by Cook, who named it King George's Sound, but afterward called Nootha after the settlement there.

**Nopal.** *Opuntia cochinellifera.* Cylindrical cactus of Central America, supporting the cochineal insect. It is extensively cultivated in Mexico, Brazil, Madeira, and the Canaries.

**"No Popery" Riots.** See GORDON RIOTS.

**Norbertines.** See PREMONSTRATENSIANS.

**Nordau,** MAX SIMON, b. 1849 in Pesth. German dramatist, descriptive writer, and philosopher, of Jewish parentage. *Conventional Lies*, 1883. His *Entartung* (Degeneration), 1894, tr. 1895, caused much discussion.

**Nordenham.** Small seaport on left bank of the Weser, 6 m. s.w. of Bremen, opposite Bremerhaven.

**Nordenskiold,** NILS ADOLF ERIC. b. 1832 in Finland. Arctic explorer under Swedish auspices. He accomplished the n.e. passage 1878–79, was made a Baron 1880, and pub. *Voyage of the Vega*, tr. 1881.—His father, NILS, 1793–1866, wrote on the Mineralogy of Finland, 1820, and explored the Greenland ice-sheet and the n. coast of Siberia.

**Nordhausen Sulphuric Acid.** See DISULPHURIC ACID.

**Nordheimer,** ISAAC, Ph.D., 1809–1842. German Jew, prof. Univ. N. Y. 1836. *Hebrew Grammar*, 1838–41.

**Nordhoff,** CHARLES, b. 1830 in Prussia. American journalist and author. *Cape Cod*, 1868; *California*, 1872–88.

**Nördlingen.** Town of w. Bavaria, on the Eger. Here the Austrians defeated the Swedes under Count Horn Sept. 6 and 7, 1634, and were defeated by Turenne 1645. Pop. ab. 8,200.

**Nore.** Sandbank near the mouth of the Thames; scene of a mutiny in the English fleet May 20–June 13, 1797.

**Noreen,** ADOLF GOTTHARD, b. 1854. Prof. Upsala 1887; writer on Scandinavian grammar.

**No-Rent Land.** Land of such degree of economic productivity that it will be cultivated if no rent is required for it, but will be left uncultivated rather than pay rent.

**Norfolk.** City of N. co., Va., at the foot of Chesapeake Bay and mouth of Elizabeth River. It was founded 1705; burned by the British Jan. 1776; chief naval depot of the Confederacy May 19, 1862. It has a fine harbor and considerable commerce. Pop., 1890, 34,871.

**Norfolk,** JOHN HOWARD, DUKE OF, ab.1430–1485. Admiral of England; Duke 1483; killed at Bosworth, and attainted.—His son, THOMAS, 1443–1524, victor at Flodden, gained the title 1514. —His son, THOMAS, third Duke, 1473–1554, uncle of Catharine Howard, narrowly escaped Henry VIII.'s vengeance 1547.—His grandson, THOMAS, fourth Duke, 1536–1572, was executed.

**Norfolk Island.** In the S. Pacific; area 13 sq. m.; discovered by Cook 1774. It was a penal settlement for convicts from New South Wales 1788–1805 and 1826–55. Pop., 1888, 741. See PITCAIRN'S ISLAND.

**Norian.** Upper Laurentian rocks.

**Noricum.** Ancient Roman province, s. of the Danube and w. of Pannonia; now Austria, Styria, and Carinthia.

**Normal** TO A LOCUS. Straight line at right angles to the direction of the locus at any given point, therefore perpendicular to the tangent at that point. When its length is considered, reference is to the portion limited by the locus and either the axis or some fixed line related to the locus.

**Normal Acids.** Rare; considered to be the maximum hydroxyl derivative of the element from which the common forms of acids are derived; *e.g.*, normal sulphuric acid, $S(OH)_6$, normal nitric acid, $N(OH)_5$.

**Normal Economic Action.** Action in accordance with standards or general rule or customs; therefore to be expected or counted on beforehand.

**Normal Labor-Day.** Such length of day's labor, determined by statistical investigation, as would produce in the aggregate the amount of commodities found to be required for the national consumption within a given period.

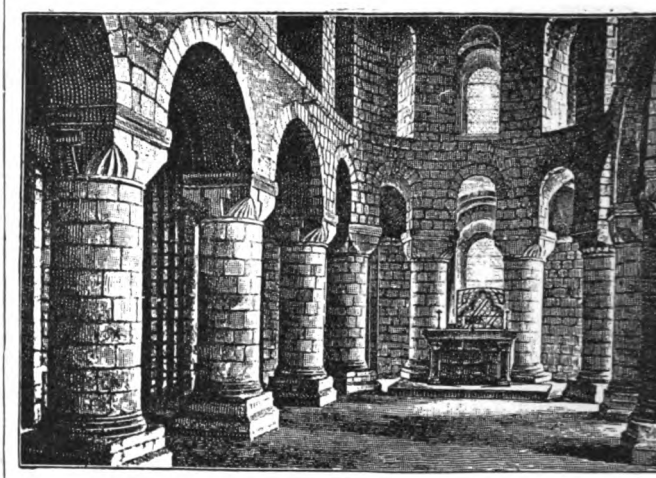
**Normal Pressure** OF WATER. On a submerged surface it is found by multiplying together the area of the surface, the depth of its center of gravity below the surface, and the weight of a cubic foot of water.

**Normal Price.** Price which conforms closely to the cost of production, approximating more or less nearly to the market price of the given commodity, though never coinciding with it.

**Normal Schools.** Institutions where persons are instructed in the principles and practice of teaching: a training school for teachers. They are supported by the States, sometimes by the cities, and are free.

**Normal Solution.** Made by dissolving the number of grams represented by the molecular weight, in one liter of the solvent; *e.g.*, a normal solution of hydrochloric acid would contain 36.5 grams (its molecular weight) in one liter of water. A normal solution of a dibasic acid would contain half its molecular weight in grams. A decinormal solution is one-tenth as strong as a normal solution.

**Norman Architecture.** That modification of Romanesque architecture that prevailed in Normandy itself and in England after the Norman conquest, from the middle of the eleventh until nearly the close of the twelfth century. The style extended also to Scotland and even to Ireland, although the round towers of the latter island are examples of an earlier and independent development. The monuments of the Norman conquerors of Sicily also show the influence of their native land. The round arch and pier with attached columns, which were the badges of Romanesque architecture throughout Europe, are conspicuous in the Norman erections, but the detail is characteristic. The moldings and ornaments are large and simple, such as could be worked with primitive tools and with a moderate degree of skill, and are rude and clumsy compared with the subsequent work of the chisel in Gothic architecture. Nevertheless, they are so vigorously designed and wrought as to be effective in mass, and arches decorated with the billets



Norman Architecture.

and lozenge and dog tooth often produce an impression of power and richness. In England the construction shows more timidity than in Normandy. While the great churches of Caen are vaulted throughout, in England the builder of the Norman cathedrals hesitated to span the naves with masonry, and confined the vaulting to the narrow aisles. There are remains of Norman work in nearly all the chief churches of England, but the naves of Peterborough, Ely, Norwich, and Winchester are the most characteristic examples, the choirs and the fonts being for the most part in Gothic. In Normandy itself the nave-arcade of Bayeux is one of the most successful pieces of Norman work, while St. Nicholas and St. Pierre at Caen and the abbey of St. George Borheville give the most adequate idea of a Norman exterior. The principal castles in England are of the Norman period, and more or less illustrate the Norman style, while many parish churches retain Norman features, some of high interest.

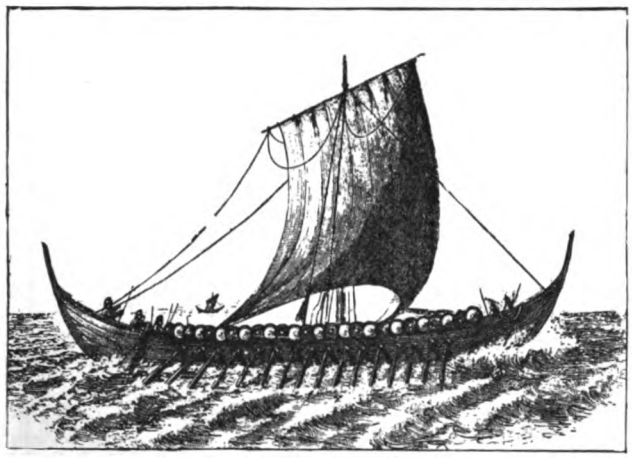
**Norman Conquest.** William of Normandy, claiming a hereditary and recognized right to the throne, with the Pope's sanction, invaded England, defeated and killed Harold at Hastings, Oct. 14, 1066, and was crowned Dec. 25. He quelled revolts, solidified his power, distributed the whole territory among the Norman nobles, and established a strong central authority. The transformation thus effected was of momentous consequence to state and people.

**Norman French.** French dialect of Normandy.

**Normandy.** Old province of n. France; under the Franks a part of Neustria; given by Charles the Simple to Rollo, as fief of French crown, 912. William, 7th duke of N., who conquered England 1066, was deprived of N. by his son Robert. It was seized by Phillipe-Augustus 1204, and held by France till 1415, then reconquered by England, and held till 1450. England still holds the neighboring islands.

**Normans.** Piratical Northmen, who from 912 settled on the Seine, adopted a new language, new laws, customs, and religion, and gave their name to Normandy. They were an enterprising, restless, lawless folk. Their first chief, Rolf, or Rollo, received baptism and swore fealty to Charles the Simple. A prolonged rivalry between a heathen and a Christian party ended ab. 944 in the supremacy of the latter. Ab. 1040 12 Norman counts gained 12 cities with their lands in Apulia and organized a military republic. Robert Guiscard, first duke of Apulia, founded the kingdom of Naples 1059; Roger, his nephew

conquered Sicily from the Saracens, and ruled the kingdom of the two Sicilies, which lasted 1131–1186. Robert, brother of Guiscard, even aspired to the conquest of the Eastern empire, and defeated the emperor in a great battle at Durazzo 1081,



Norse Ship of the Tenth Century.

but was recalled by trouble in Italy. In 1084 he defeated the German emperor and sacked Rome. The Norman Kingdom in s. Italy lasted till 1194. Everywhere the Normans accepted the institutions of the more highly civilized peoples whom they conquered, and so disappeared as a separate race.

**Norns,** NORNEN, or NORNIR. Norse fates, Past, Present, and Future, who sat beneath the world-tree Yggdrasil, and watered its roots. In later times each man was believed to have his norn.

**Norona,** GASPAR MARIA DE NAVA ALVAREZ, CONDE DE, 1760–1815. Spanish dramatist, poet, and translator.

**Norridgewock.** Indian village in Me., burned 1724, after the rout of French and Indians intrenched there.

**Norris,** JOHN, 1657–1711. Anglican theologian, poet, and Platonic philosopher.

**Norris,** WILLIAM EDWARD, b. 1847. English novelist. *Matrimony*, 1881; *My Friend Jim*, 1886; *Chris*, 1888; *His Grace*, 1892.

**Norristown.** Capital of Montgomery co., Pa., on the Schuylkill River, 16 m. n.w. of Philadelphia. Pop., 1890, 19,791.

**Norse.** See SCANDINAVIAN.

**Norse Music.** The characteristics of the folk-songs and dances of Norway, Sweden, and Denmark have been copied by the composers of those countries: as a result critics speak of a Norse School of Music. Its pioneer was GADE (q.v.); its best representative to-day is GRIEG (q.v.). Its prevailing sentiment is melancholy, though there is merriment in some of the playful songs and energetic dances, such as the halling and spring dance. The popular instruments of the Norse people are the Loor, a long wooden trumpet or horn, the harp, and the Hardanger fiddle, which, like the viol d'amour, has an extra set of metallic strings running under the finger-board, which are not touched by the bow but vibrate sympathetically with the gut strings. Among the better known Norse composers are Ole Bull, Gade, Grieg, Kjerulf, and Svendsen.

**North,** CHRISTOPHER. See WILSON, JOHN.

**North,** FRANCIS, BARON GUILFORD, 1637–1685. Solicitor-gen. 1671; Atty.-gen. 1673; Chief-Justice of Common Pleas 1675; Keeper of the Seal 1682; Baron 1683. Three of his brothers were of note.—SIR DUDLEY, 1641–1691, was Sheriff of London, M.P., and author of *Discourses upon Trade*, 1691.—JOHN, 1645–1683, was prof. at Cambridge, and edited Plato.—ROGER, 1653–1734, was Atty.-gen. 1685–88, and the family biographer.

**North,** FREDERICK, 1732–1792. M.P. 1754; Lord of the Treasury 1759–65; Chancellor of the Exchequer 1767; Premier 1770–82; promoter of the measures which led to the American Revolution; blind from 1787; Earl of Guilford 1790.

**North,** JOHN THOMAS, 1842–1896. English speculator in S. America; "Nitrate King"; said to be worth some £25,000,000.

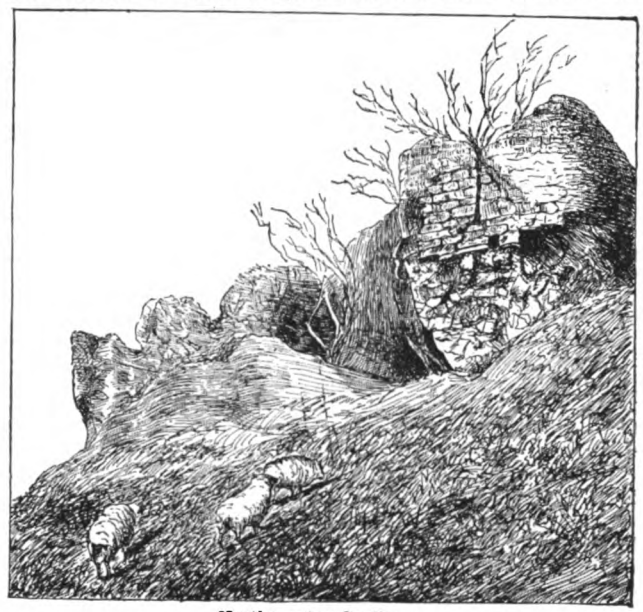
**North,** SIR THOMAS, ab.1535–ab.1601. Translator of Plutarch 1579.—His father, SIR EDWARD, 1496–1564, was the first Baron North.

**North Adams.** Town of Berkshire co., Mass., on the Hoosic River. Pop., 1890, 16,074.

**North America.** One of the two grand divisions of the continent of America. In shape it is rudely triangular, the broad part being on the n., and the narrow point projecting s., where, by the Isthmus of Panama, it is connected with S. America. The e. coast is irregular, being entered by great arms of the Atlantic, as Hudson's Bay and the Gulf of Mexico, and having long peninsulas, as Labrador, Florida, and Yucatan. The w. coast is simple, especially in its s. part, where the Gulf and Peninsula of California are the only large coast features. The n.w. coast is more broken, containing numerous islands, with fiords traversing them and extending into the mainland. The w. part consists of a high plateau of great breadth, capped by numerous mountain ranges, the Cordilleras of N. A. This attains its greatest altitude in the U. S., diminishing thence n. and s. In Mexico it comprises with its slopes nearly the whole breadth of the continent, and supports many volcanic peaks. E. of this is a great depression or valley, drained mainly by the Mississippi, the great lakes, and the Mackenzie, while still further e., near the Atlantic shore, is a secondary system of elevation, appearing in the U. S. and Canada, shorter, narrower, and lower than the western system: this is the Appalachian system. The area of N. A. is 7,623,050 sq. m., and its mean height 1,888 ft. The principal rivers are the St. Lawrence, Mackenzie, Mississippi, Yukon, Columbia, and Colorado. The climate ranges with the latitude and the elevation, from the temperature of the tropics to that of the Polar circle. The rainfall of the e. part is everywhere ample without being excessive; on the Cordilleran plateau it is scanty, and much of this area is a desert; on the n.w. coast it is excessive. The countries are the U. S., Canada, Mexico, Guatemala, Costa Rica, Nicaragua, Honduras, Salvador, and Balize: except Canada and Balize, which belong to Great Britain, these are republics.

**North Anne,** BATTLES OF. See WILDERNESS, BATTLES OF THE.

**Northampton.** Borough of England on the Nene, 66 m. n.w. of London. It has large manufactures of boots and shoes.



Northampton Castle.

Here Henry VI. was defeated and taken by the Yorkists July 10, 1460. Here is the church of St. Sepulchre one of the few round Churches in England. Pop., 1891, 61,016.

**Northampton.** Capital of Hampshire co., Mass.; on the Connecticut; founded 1754. Pop., 1890, 14,990.

**Northbrook,** THOMAS GEORGE BARING, LORD, b. 1826. M.P. 1857; Sec. for India 1859–61, for War 1861–66 and 1868–72; Baron 1866; Viceroy of India 1872–76; Viscount 1876; First Lord of Admiralty 1880–86.

**North Cape.** Northernmost point of Europe, on an island of Norway, lat. 71° 10′ N.

**North Carolina.** One of the e. States. Area 52,250 sq. m. The e. part is low, level, and largely marshy. Westward it rises gradually to the foot of the Blue Ridge, which is spread out into an extensive group of high mountains, forming the culminating part of the Appalachian system. It contains many peaks exceeding 5,000 ft. and several above 6,000 ft. in elevation, Mt. Mitchel, the highest summit of the Appalachian system, being 6,707 ft. high. Most of the streams head in the Blue Ridge and flow s.e. to the Atlantic; a few head in the high mountains and flow w. to the Tennessee. The larger of the Atlantic streams are navigable to the Fall Line, at the junction of the Archæan and Eocene formations. The surface

geology of the State is simple. The mountain region and the upper part of the Atlantic slope are covered by Archæan rocks. To these succeed a belt running n.e. and s.w. of the Eocene formation, in turn succeeded by a broad extent of Neocene beds stretching to the coast. The industries mainly relate to agriculture. Tobacco and cotton are raised in large quantities. The value of farms in 1890 was $183.977,010; of agricultural products, 1889, $50,070,530. The cotton crop in 1894–95 was ab. 465,000 bales, and tobacco, 1894, 42,043,626 lbs. In 1894, 546,855 lbs. of monozite, value $36,193, and 323 tons of zinc ore were mined. The mileage of railroads at the close of 1893 was 3,577. Attempts at colonization were made 1585 and 1587. In 1663 a grant was made to eight noblemen of the province, including both Carolinas, and shortly after came colonies of French, Swiss, and German immigrants. The province was divided 1729, and separate governments established. N. C. ratified the Declaration of Independence and framed a State constitution 1776. She seceded May 1861. Capital, Raleigh. Pop., 1890, 1,617,947. (See Map, page 157.)

**Northcote,** JAMES, 1746–1831. English portrait painter, pupil and assistant of Sir Joshua Reynolds. His best work, however, was in portraiture of a semi-historical nature. N. exercised the pen as well as the pencil. His literary ability being of no mean order as his *Life of Reynolds*, 1813, testifies.

Mortimer and Richard Plantaganet, by Northcote.

**Northcote,** SIR STAFFORD HENRY, 1818–1887. M.P. 1855; Conservative leader; Sec. for India 1867–68; Chancellor of the Exchequer 1874; Earl of Iddesleigh 1885. *Twenty Years of Financial Policy*, 1862.

**North Dakota.** One of the n. States, formed 1890 from DAKOTA (q.v.); area 70,795 sq. m. The part e. of the Missouri is mainly an upland prairie or plain, fertile, but somewhat deficient in rainfall. The portion s.w. of the Missouri is arid and poorly watered. In 1895 there was produced 658,979 bushels corn, 61,057,710 bushels wheat, and 19,067,414 bushels oats. Capital, Bismarck. Pop., 1890, 182,719. (See Map, page 159.)

**North Dakota,** UNIVERSITY OF. At Grand Forks; opened 1884. It offers courses in arts, science, and normal training; had (1896) 11 instructors, 55 collegiate students, and 199 in all departments.

**North Devon.** Island of arctic N. America, w. of Baffin's Bay.

**Northeastern Boundary** OF THE U. S. Finally settled by a treaty negotiated at Washington by Webster and Lord Ashburton, signed Aug. 9, 1842. Of the territory in dispute, seven-twelfths, or 7,000 sq. m., were set off to the U. S.

**Northern Crown.** See AURORA.

**Northern Lights.** See AURORA.

**North German Confederation.** Formed, 1866, between Prussia and all the German states n. of the Main, those which had sided with Austria having been previously incorporated with Prussia.

**North Holland Canal.** Canal 51 m. long, from Burksluyt, opposite Amsterdam, to the Helder. It is 124 ft. broad at top and 31 ft. at the bottom, and admits vessels of 18 ft. draft.

**Northing and Southing.** Distance of one end of a line of a survey n. or s. of the other; often called difference of latitude. In any closed field the sum of the northings is equal to the sum of the southings.

**Northmen.** Scandinavian pirates who infested w. Europe. See NORMANS.

**North Park.** Broad valley in n. Colorado and s.w. Wyoming. Average elevation 8,000 ft.

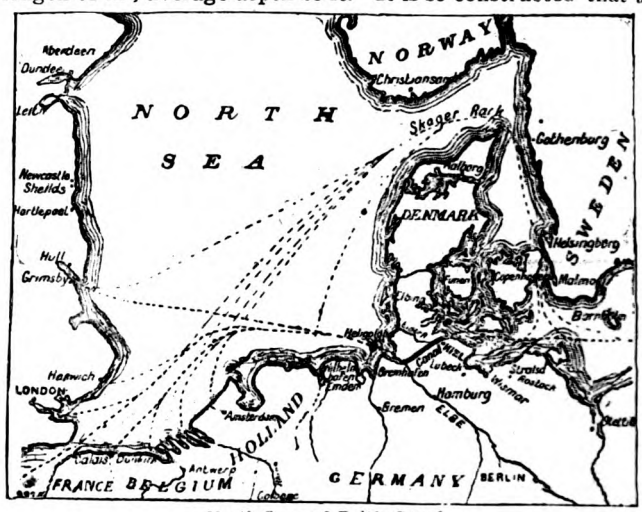
**North River.** The Hudson; so called by the Dutch, the Delaware being South River.

**North River Bridge.** One of over 3,000 ft. span to cross the Hudson at New York. The design of the North River Bridge Co. is for a braced suspension structure of 3,100 ft. central span and a total length of 7,340 ft. Other designs are for a simple suspension bridge and for a cantilever structure. The cost is estimated at from $20,000,000 to $30,000,000.

**Northrop,** CYRUS, b. 1834. Prof. Rhetoric and English Literature at Yale 1863–84. Pres. Univ. Minn. 1884.

**North Sea,** or GERMAN OCEAN. That part of the N. Atlantic between the British Isles on the w. and Holland, Germany, Denmark, and Norway.

**North Sea and Baltic Canal.** Ship canal in Prussia constructed from 1887–1895. It commences at the mouth of the Elbe above Brunsbuttel, joins the Eider near Wittenbergen, following this river to Rendsburg, and from there utilizing the Eider Canal, terminating at Holtenau, 2½ m. n. of Kiel. Total length 61 m., average depth 28 ft. It is so constructed that a




North Sea and Baltic Canal.

slight current of saline water enters from the Baltic to the Elbe, thus diminishing the freezing in that river. The canal shortens considerably the sea route between the Baltic ports and the British coast s. of Newcastle. The cost of construction was £7,800,000.

**North Somerset.** Island of N. America, in the Arctic Ocean.

**Northumberland,** JOHN DUDLEY, DUKE OF, 1502–1553. Premier 1550, Duke 1551; beheaded 1553; father-in-law of Lady Jane Grey.

**Northumbria.** Anglian Kingdom, formed by the union of Bernicia and Deira 560. It extended from the Humber to the Forth, and became subject to Wessex 841.

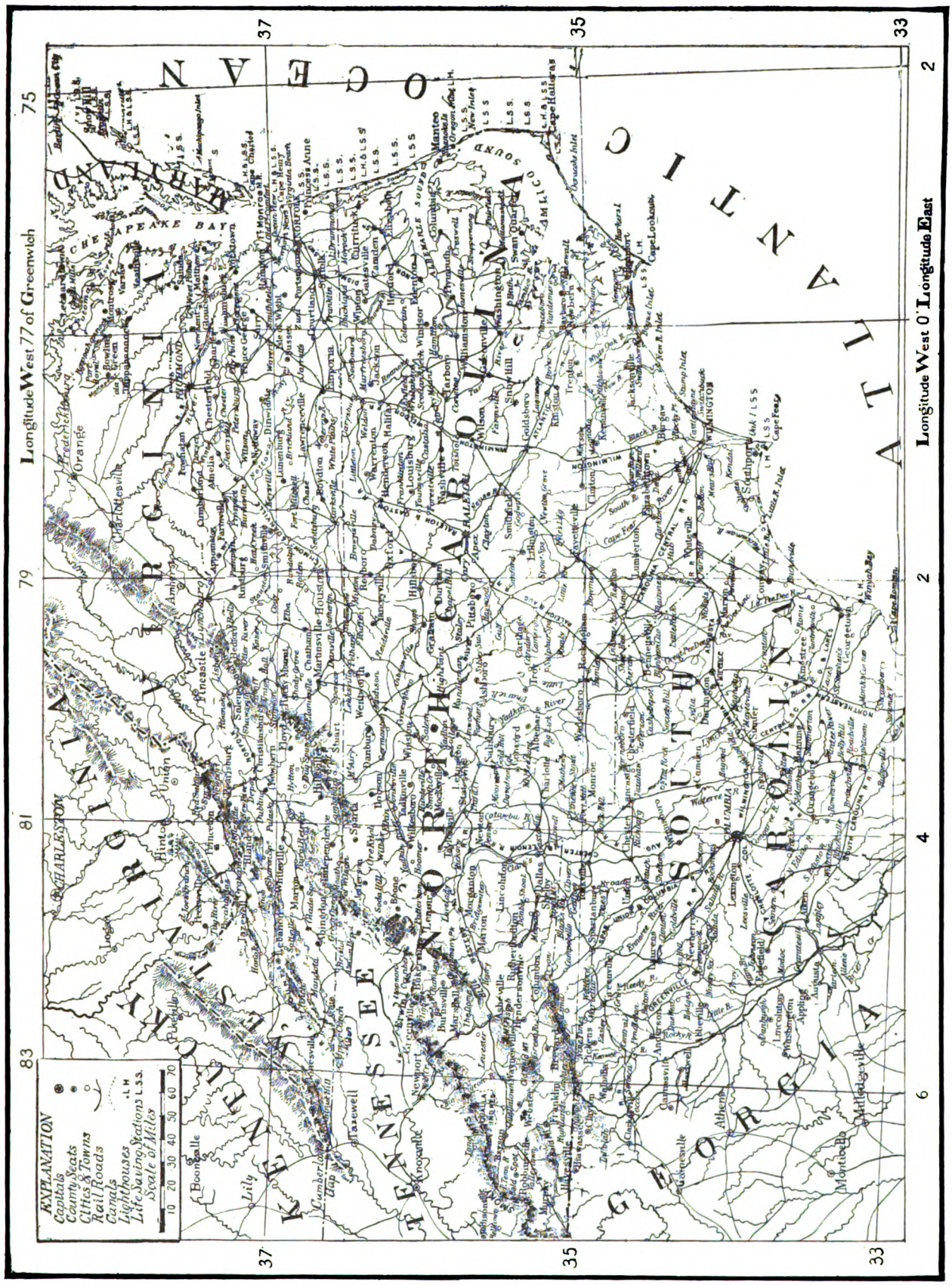
**Northwestern Boundary** OF THE U. S. The s. limit of the Russian possessions in America was arranged at 54° 40′, but the territory s. was, by the treaty of 1818, jointly occupied by the U. S. and Great Britain. The latter had trading stations there, but in 1842–43 strong colonies crossed the Rocky Mts. to settle, and in 1846 the line of 49° was accepted by England as a compromise, though the presidential campaign of 1844 had been made by the Democratic party on the issue of "54° 40′ or fight."

**Northwestern University.** Chartered 1851, organized 1855. The department of Arts, the Garrett Biblical Institute (M.E.), and school of music are at Evanston, Ill.; the schools of medicine, law, dentistry, and pharmacy are in Chicago. The institution has in all some 200 teachers, 3,016 students, and property valued at $4,000,000.

**Northwest Passage.** The attempt to find a passage from Atlantic to Pacific by the n. coast of America began ab. 1490, and was continued at various times by Hudson, Baffin, Fox, Ross, Parry, and Sir John Franklin. Many important discoveries were made, but it was not until expeditions were sent out in search of Franklin that McClure, 1850–52, succeeded in penetrating from Bering's Strait to Baffin's Bay, thus setting at rest all doubts as to the existence of a N.W. passage. Several routes have since been determined, though from a mercantile point of view they are all useless.

**Northwest Territory,** CANADA. Originally, all that portion of British N. America n. and w. of the provinces of the St. Lawrence basin. In 1869–70 the territories of Rupert's Land were incorporated with Canada, and by 1882 five other provinces were organized. At present, therefore, the term merely designates the remnant of unorganized territory.

**Northwest Territory,** U. S. Tract w. of Pa. and between the Ohio, the Mississippi, and the great lakes; ceded to the Federal Government by Va., N. Y., Mass., and Conn., and governed by the ordinance of 1787.


Longitude West 77 of Greenwich
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EXPLANATION
Capitals
County Seats
Cities & Towns
Rail Roads
Canals
Lighthouses
Life Saving Stations
Scale of Miles
10 20 30 40 50 60 70
ATLANTIC OCEAN
CHESAPEAKE BAY
VIRGINIA
TENNESSEE
SOUTH CAROLINA
GEORGIA
NORTH CAROLINA
RALEIGH
WILMINGTON
Cape Hatteras
Cape Lookout
Cape Fear
Manteo
Washington
Elizabeth City
Edenton
Kinston
Goldsboro
Fayetteville
Wilmington
Southport
Asheville
Charlotte
Salisbury
Greensboro
Durham
Raleigh
Wilson
Rocky Mount
Tarboro
Weldon
Henderson
Roanoke Rapids
Elizabeth City
Morehead City
Beaufort
Swan Quarter
Ocracoke Inlet
Hatteras Inlet
Bogue Inlet
Masonboro Inlet
Cape Fear River
Neuse River
Tar River
Roanoke River
Chowan River
Pamlico Sound
Albemarle Sound
Currituck Sound
Core Sound
Bogue Sound
Masonboro Sound
Cape Hatteras L.H.
Cape Lookout L.H.
Cape Fear L.H.
Bodie Island L.H.
Currituck Beach L.H.
Ocracoke Inlet L.S.S.
Hatteras Inlet L.S.S.
Bogue Inlet L.S.S.
Masonboro Inlet L.S.S.
Cape Fear L.S.S.
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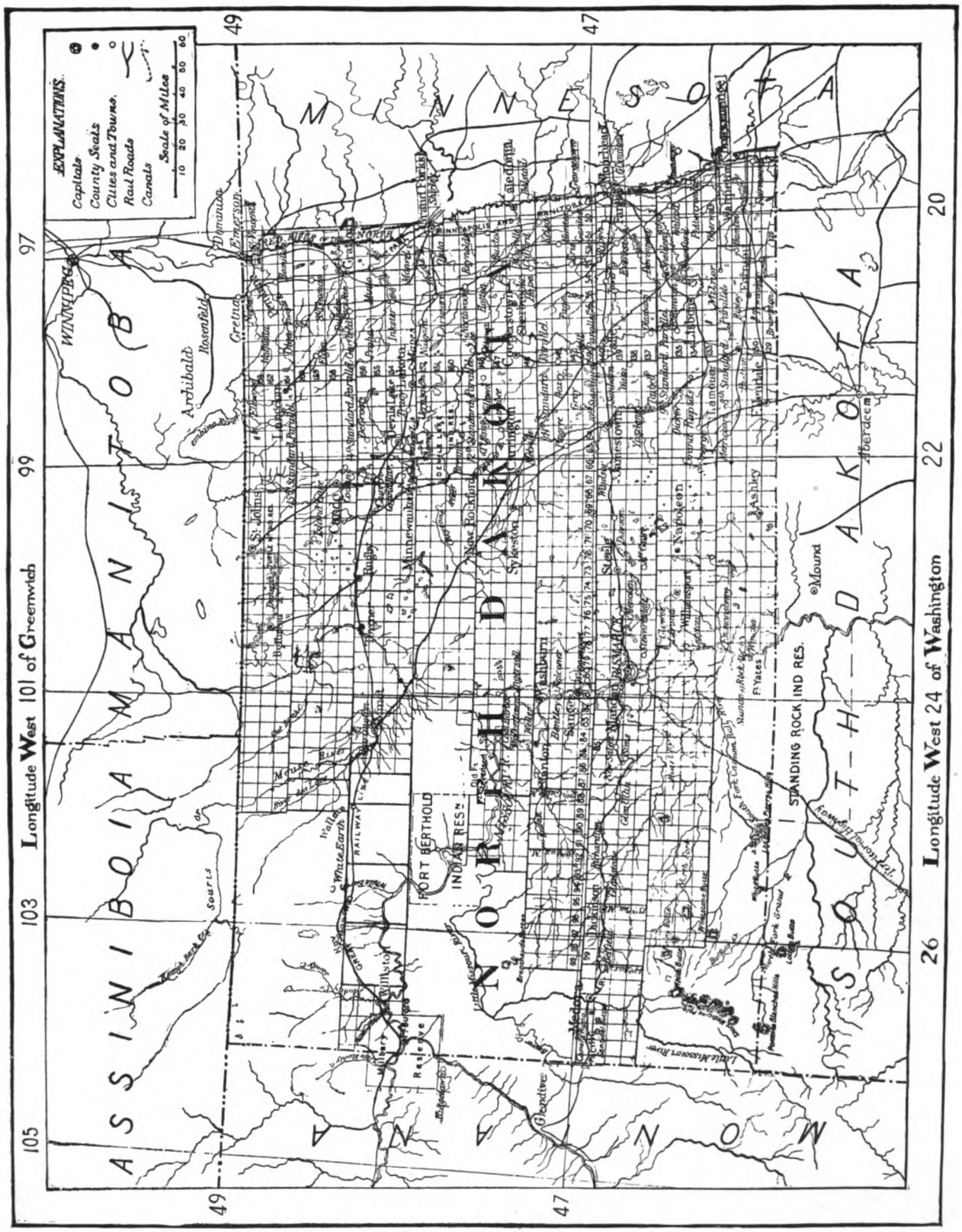
EXPLANATIONS.
Capitals
County Seats
Cities and Towns.
Rail Roads
Canals
Scale of Miles
10 20 30 40 50 60
Longitude West 101 of Greenwich
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MINNESOTA
SOUTH DAKOTA
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ASSINIBOIA
NORTH DAKOTA
WINNIPEG
Emerson
Gretna
Rosenfeld
Arbuthnot
Dominion
Grafton
Cavalier
Pembina
Langdon
Hamilton
Bathgate
Leeds
Rolla
Dunseith
Mohall
Lansford
Bottineau
Westhope
Souris
Carbury
Willow City
Maxbass
Kenmare
Bowbells
Lignite
Portal
Noonan
Ambrose
Crosby
Fortuna
Columbus
Stanley
Powers Lake
Alamo
Ft. Berthold Indian Res.
Ft. Berthold
Parshall
Plaza
Palermo
Mandaree
Ft. Yates
Standing Rock Ind Res.
Mound
Aberdeen
Ashley
Flasher
Glenburn
Minot
Sherwood
Berthold
Ryder
Voltaire
Velva
Drake
Anamoose
Harvey
Carrington
Sykeston
Cathay
Wing
Tuttle
Steele
Kensington
Cooperstown
Jamestown
Medina
Pingree
Buchanan
Gackle
Sanborn
Litchville
Ellendale
Oakes
Lisbon
Enderlin
Fingal
Valley City
Sheldon
Casselton
Fargo
Wahpeton
Hankinson
Fairmount
Milnor
Kindred
Mapleton
Page
Leonard
Harwood
Reile's Acres
Gardner
Arthur
Grandin
Ayr
Mapleton
Glenfield
Casselton
Tower City
Buffalo
Durbin
Ft. Ransom
Sandy Rock Ind. Res.
Ft. Seward
Ft. Totten
Devils Lake
Minnewaukan
Leeds
Rock Lake
Lakota
Langdon
Cando
Bisbee
Dunseith
Rolla

**Norton,** ANDREWS, D.D., 1786–1853. Prof. Harvard 1819–30. *Doctrines of Trinitarians*, 1833; *Evidences*, 3 vols., 1837–44; tr. Gospels 1855.—His son, CHARLES ELIOT, LL.D., b.1827, prof. Harvard since 1874, has tr. Dante's *Vita Nuova*, 1867, and *Divina Commedia*, 1891–92, and edited the Letters of Carlyle, 7 vols., 1883–88, and Lowell, 1894.

**Norton,** CAROLINE ELIZABETH (SHERIDAN), 1808–1877; m. 1827. English poet and novelist, married to Sir Wm. Stirling-Maxwell 1877. *The Undying One*, 1831; *Lady of La Grange*, 1861; *Rose of Jericho*, 1870.

**Norton,** LEWIS MILLS, Ph.D., 1855–1893. American chemist; prof. Mass. Inst. Technology 1883. *Dict. Chemical Synonyms.*

**Norton,** THOMAS, 1532–ab.1600. Author, with Sackville, of the first English tragedy, *Gorboduc, or Ferrex and Porrex*, 1565.

**Norumbega.** Mythical city in New England or Canada, supposed to have been visited 1524 by Verrazano, and thought by Champlain (1604) to be on the Penobscot; also river, dubiously identified with the Hudson and the Charles. See VINLAND.

**Norwalk.** Town of Fairfield co., Conn., on N. River, near the Sound; settled 1651. Pop., 1890, 17,747.

**Norway.** Country of the north of n. Europe, occupying with Sweden the Scandinavian peninsula; area 124,445 sq. m. The peninsula may be broadly characterized as an inclined plateau, having its crest line on the w., near the Norwegian coast, and sloping gently s.e. toward the Baltic. The coast of N. is broken with fiords and islands, and affords many deep harbors. Agriculture is the principal industry. The value of lumber exported 1890 was $10,000,000. The product of the fisheries in 1891 was $7,020,982. Manufactures are of minor importance. Commerce is large and steadily increasing, with shipbuilding. It has 971 m. of railway. The capital is Christiania. N. forms one joint kingdom with Sweden. Its constitution is democratic. The storthing or legislature meets annually. Suffrage is restricted by a small property qualification. The laws passed by the storthing must be ratified by the king,

A Norwegian Wedding.

but if passed three times become laws without his sanction. The state religion is Lutheran; Danish is the language in general use. The early history of N. is mythical. Christianity was introduced ab. 990 under Olof I. The petty chieftains who had hitherto ruled the country were brought into subjection by Olof II. 1015–30. In 1391 Magnus VIII. of Sweden was elected king. His grandson, Olof IV., was elected king of Denmark, and in 1397 the three Scandinavian kingdoms became united under his sway. The union of N. with Denmark continued till 1814, when, by the treaty of Kiel, N. was resigned to Sweden. The Norwegians, after revolting, accepted the union, on condition of retaining their new constitution, and enjoying full independence within their own borders. Discontent has grown of late, with desire for separation. Pop., 1891, 2,000,917.

**Norwegian Language.** See SCANDINAVIAN.

**Norwegian Literature.** Norway has an ancient and modern period of literary history. The ancient period is that of the SAGAS (q.v.). See also ICELANDIC, and SCANDINAVIAN LITERATURE. The modern period begins ab. 1772. See DANISH LITERATURE.

**Norwegium.** Ng. At. wt. 219, mpt. 254° C. One of the doubtful elements, announced by Dahll 1879, found in nickel glance from Norway; like bismuth.

**Nor'wester.** Cold, heavy, anti-cyclonic gales of the n. Atlantic; also strong n.w. winds or straight line gales blowing over Bengal with dust and rain.

**Norwich.** City of e. England, on the Wensum, 114 m. n.n.e. of London; held by Danes 878; burned 1004; sacked by

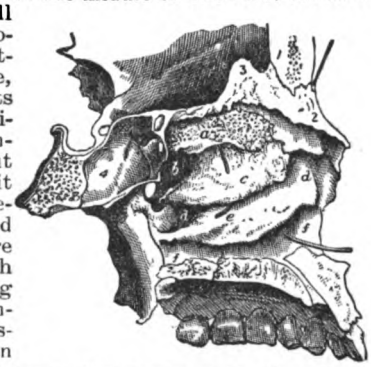
Norwich Cathedral.

the French 1216; largely peopled by Flemish weavers 1336, and by Dutch refugees 1558–1600. It has a fine cathedral and extensive manufactures. Pop., 1893, 104,184.

**Norwich.** City of New London co., Conn., on the Thames, at the head of tide and navigation; settled 1659, chartered 1784 and 1871. It has manufactures of paper, cotton goods and firearms. Pop., 1890, 16,156.

**Norwood's Tincture.** Preparation of green hellebore.

**Nose.** Organ situated in the middle of the face, concerned in (1) the sense of smell through the action of odoriferous substances exciting the olfactory nerve, which is distributed in its upper part; (2) in respiration, warming the inspired air and filtering out the dust particles as it passes through the somewhat narrow and curved passages whose walls are abundantly supplied with blood-vessels furnishing the warmth; (3) in connection with the accessory cavities, to assist in phonation.



Longitudinal Section of the Nasal Fossæ of the Left Side, the Central Septum being removed:

1, frontal bone; 2, nasal bone; 3, part of ethmoid bone; 4, sphenoidal sinus. *a*, superior turbinated bone; *b*, superior meatus; *c*, middle turbinated bone; *dd*, middle meatus; *e*, inferior turbinated bone; *ff*, inferior meatus; *gg*, a probe passed into the nasal duct.

**Nosean,** or NOSITE. $2Na_2Al_2Si_2O_8 + Na_2SO_4$. Natural sodium aluminium silicate combined with a sodium sulphate, found in Germany and the Canary Islands.

**Nosology.** Classification of diseases. That of the Royal College of Physicians, London, is usually followed. I. General diseases. A. Those due to morbid poisons: 1, Small-pox, measles, scarlet fever, typhus, diphtheria, typhoid fever, cholera, etc.; 2, Malarial diseases, as ague, beri-beri, etc.; 3, Erysipelas, pyæmia, septicæmia, etc.; 4, Venereal diseases; 5, Occurring in animals usually, as hydrophobia, glanders, anthrax. B. Those dependent on other external agents: 1, Parasites; 2, Poisons; 3, Injuries; 4, Errors of diet. C. Developmental diseases: Immaturity, malformations, debility, old age. D. Unclassified: Rheumatism, gout, tubercle, cretinism, leprosy, anæmia, diabetes, etc. II. Local diseases: Nervous system, circulatory system, respiratory system, digestive system, lymphatic system, urinary system, generative system, organs of locomotion, and the skin.

**Nostalgia.** Form of melancholia characterized by a longing to return, usually to one's home; homesickness.

**Nostochineæ.** Sub-class and order of *Cyanophyceæ* or blue-green *Algæ*, including all the forms having a filiform habit due to the aggregation of individual cells into chains or filaments, generally inclosed in a common gelatinous sheath.

**Nostradamus** (MICHEL DE NOTREDAME), 1503–1566. French physician and astrologer of Jewish descent, famous for his Prophecies, issued in verse 1555.

**Nostril.** External orifice of the nose. It assists in respiration by its movements; this can be readily seen when the breathing is labored.

**Nostrils,** DISEASES OF. Nose bleeding may be due to a blow, internal abrasion, ulceration, or morbid growths within the nose. The blood-vessels may be diseased or the circulation elsewhere obstructed. It is most frequent with the young and with males. To arrest it, the person should sit at an open window, head thrown backward, the nostrils compressed, cold applications to the back of the neck, followed by astringent injections, as alum in water or powdered galls; as a final resort the nostrils should be plugged with lint or ferric oxide. Post-nasal catarrh is very common in U. S., and is due to cold draughts of air or irritating dust. It is treated with local sprays of alkaline solutions, followed by astringent powders or ointments of catechu, iron sulphate, or boracic acid. See CATARRH.

**Nota,** ALBERTO, BARON, 1775–1847. Italian dramatist, noted for sentimental comedy.

**Notables,** ASSEMBLY OF. Called 1787–88 by Louis XVI., at the instigation of the Minister Calonne, to look into the state of the finances. Calonne's proposals for reform were rejected.

**Notary Public.** Officer whose principal function is that of publicly attesting papers, so that they may be used as evidence in other jurisdictions.

**Notation.** In Mathematics, system of signs and symbols for expressing quantity, processes, and relations.

**Notation,** MUSICAL. Wherever music has become an art it has acquired a system of written symbols. The most ancient notation of which knowledge has been preserved is that of the Greeks, who used the letters of their alphabet to represent tones. In this they were followed by the Romans, and in the early centuries of the Christian era letters were still used to note the church chants. Though the staff and notes have replaced them as tonal symbols, the first seven letters of the Latin alphabet still give their names to the tones. Before 700 a system of arbitrary signs called Neumæ came into use. Dots, dashes, hooks, curves, and the like were written over the words. They were at first little more than memory-helps, since they did not indicate the fixed pitch of the tones like the letters, but merely suggested the general movement of the melody, the intervals of which were preserved by tradition. Ab. 900 a red line drawn over the text fixed the pitch of all the neumæ written upon it at F; the other symbols stood for acuter or graver tones, as they were written above or below the line. Here was the germ of the modern staff. After a while a second line, yellow, was added above the red, with the result that greater definiteness of pitch was given to the neumæ. The placing of the letters F and C upon these lines gave rise to the modern clefs. The modern staff was practically introduced when two more lines were consorted with the red and yellow ones, in the 10th century. The modern notes were developed out of the more common forms of neumæ, and modifications of the symbols, so as to make them express time values, came into use in the 12th century.

**Nothnagel,** HERMANN, b. 1841. Prof. Jena 1874 and Vienna 1882; writer on pathology and physiology.

**Notice.** Knowledge of a fact, or of circumstances which should induce an inquiry which would result in knowledge of such fact.

**Notidanus** (COW SHARK). Tropical shark with one vertical dorsal fin, six gill sacs, and a small spiracle. There is a well-developed lateral line, and various sorts of teeth, different in the two jaws. No nictitating membrane is present.

**Notion.** Generally, conception. Sometimes it signifies the unpicturable, as conception the picturable or representative ideas of pure reason.

**Notker Balbulus,** ab.840–912. Swiss monk of St. Gall, beatified 1513; author of many valued Latin sequences or hymns. Of the 115 ascribed to him, 70 are probably his.

**Notobranchiata.** Group of Chætopod worms, having gills on the notopodia: the parapodia are usually present. *Chætopterus*, *Aphrodite*, *Diopatra*, *Nereis*, and *Arenicola* are examples.

**Notochord.** Cartilaginous rod which is present in *Amphioxus* instead of a backbone, and which appears in all Vertebrate embryos before any of the vertebræ are formed. In the *Ichthyopsida* there are more or less remains of this in the middle of the vertebral bodies.

**Notopoda.** See CRABS.

**Notopodia.** Dorsal portion of the parapodia of an Annelid, or homologous structures borne on the dorsal side of the segments of some worms.

**Nototherium.** Extinct herbivorous genus of gigantic quadrupeds, found in the upper Tertiary of Australia.

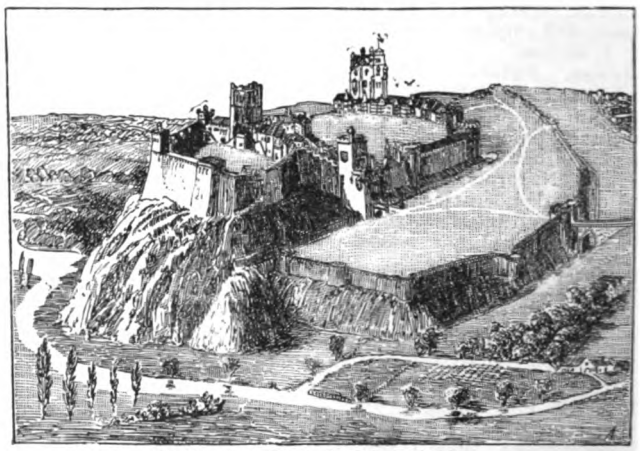
**Nototribe.** Flowers in which, in the process of cross-fertilization by insects, the pollen is carried away on the back of the insect.

**Not Proven.** Verdict of a jury in a Scotch criminal trial, to the effect that the guilt of the accused is not made out, though his innocence is not clear. The same as not guilty, but it leaves the person under suspicion.

**Notre Dame.** Name given to churches in France which are dedicated to the Virgin, particularly the Cathedral of Paris.

**Nott,** ELIPHALET, D.D., LL.D., 1773–1866. Pres. Union Coll., Schenectady, N.Y., from 1804; eminent as an educator, executive, and reformer.—His cousin, JOSIAH CLARK, M.D., 1804–1873, wrote, with G. R. Gliddon, *Types of Mankind*, 1854, and *Indigenous Races*, 1857, to disprove the unity of the human race.

**Nottingham.** Borough of central England, near the river Trent; held by Danes till 868. Here Charles I. began the civil



Nottingham Castle in 16th century.

war 1642. It has large manufactures of hosiery and lace, with bleaching and dye-works. Pop., 1891, 220,551.

**Nottingham,** HENEAGE FINCH, EARL OF, 1621–1682. Solicitor-gen. and Baronet 1660; M.P. 1661; Atty.-gen. 1670; Baron and Keeper of the Privy Seal 1673; Lord Chancellor 1675; Earl 1681.—His son, DANIEL, 1647–1730, 2d Earl, was Sec. of State 1689–93 and 1702–4; Earl of Winchelsea 1729.

**Notum.** Dorsal piece of the Arthropod segment.

**Noughts and Crosses.** English name for the game of Tit-Tat-To, from the form of the emblems marked down by the contending players.

**Noumea.** Capital of the French colony of New Caledonia Pop. 5,000.

**Noumenon.** Complement of phenomenon; hence, cause. or subject of events not accessible to sense perception, but only objects of pure thought: equivalent of the expression "thing in itself."

**Noun.** See PARTS OF SPEECH.

**Novaculite.** Fine-grained, siliceous rock, used as a whetstone, especially for razors. The best American novaculite comes from Arkansas.

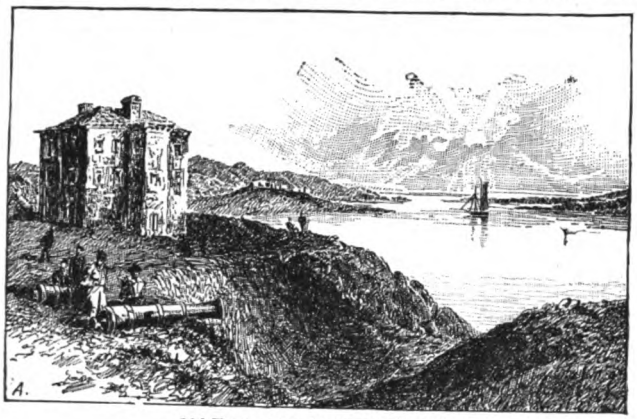
**Novakovic,** STOJAN, b. 1842. Historian of Servian literature 1867; Senator 1883; Ambassador to Turkey 1886.

**Novalis** (FRIEDRICH VON HARDENBERG), 1772–1801. German mystical and romantic poet. *Spiritual Songs*, tr. 1876.

**Novara.** Ancient town of n.w. Italy, scene of a French defeat 1513, and of Austrian victories 1821 and 1849. Pop. ab. 20,000.

**Nova Scotia.** Province of Canada. It consists of a peninsula connected with New Brunswick by a narrow isthmus, and the adjoining island of Cape Breton. Area 20,907 sq. m. It is intersected by ranges of hills, running n.e. and s.w., parallel to the coast-line. The coast is rocky, broken, and covered with forests. The leading industries are manufacture of timber, agriculture, fishing, shipbuilding, and coal-mining. N. S. was visited by the Cabots 1497, colonized 1604 by the French, and called Acadia. Its possession was hotly contested by the English. In 1667 it was ceded to France, and to Gt. Britain 1713

and 1763. The expulsion of the Acadians, 1755, is celebrated



Old Fort, near Annapolis Royal.

in Longfellow's *Evangeline*. Cape Breton was annexed 1763. Capital Halifax. Pop., 1891, 450,396.

**Novatian,** d. ab.258. Presbyter of Carthage, schismatically consecrated; founder of a Puritan sect which lasted some 300 years, and differed from the Ch. only in more rigorous discipline.

**Novation.** Extinguishment of an old obligation by the substitution of a new one. In English law the new one must be between other parties than those to the old one; *e.g.*, A owes B and B owes C: it is agreed between all parties that A shall pay C, and the two contracts to which B is a party are extinguished.

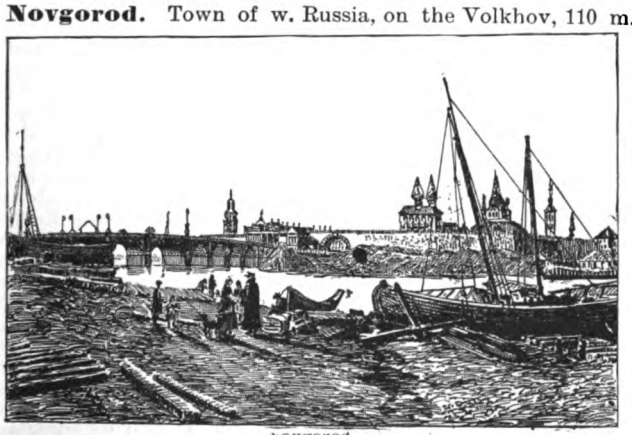
**Nova Zembla.** Group consisting of two large islands and numerous small ones, in the Arctic Ocean, n.e. of Russia, to which they belong. Area ab. 35,000 sq. m.

**Novello,** VINCENT, 1781–1861. English composer, editor, and publisher of music; of Italian parentage; father of Clara Anastasia, b. 1818, singer, married to Count Gigliucci 1843, and of MRS. MARY COWDEN CLARKE (q.v.).

**Novels.** In the wider sense, all extended prose fictions; in the narrower, those which copy real life, as opposed to the imaginative prose romance, such as those of chivalry, which survived till ab. 1700. Existing as a minor literary form among the Greeks and yet more ancient races, and revived in Italy in the shape of short tales (novelli) by Boccaccio, the novel of both kinds was highly cultivated in Spain, and to a less extent in France. In England, its importance was slight till popularized by Richardson and Fielding 1740–60. It reached its greatest vogue under Scott, whose influence was felt throughout Europe, and for some time dominant. Since his time, Dumas and Hugo in France, Cooper and Hawthorne in America, Turgenev and Tolstoi in Russia, have been followed or accompanied by a host of eminent writers. Fiction is now the largest and most prominent of literary fields, and is used not merely to entertain, but to convey lessons moral, theological, philosophic, social and political. The controversy between realism and romance is not ended, and involves that between the novel of tendency and the merely amusing story.

**November.** Eleventh month of the year. The ninth month of the Roman year. By the Anglo-Saxons it was called Blood month, a large number of cattle being slaughtered at this time.

**Novgorod.** Town of w. Russia, on the Volkhov, 110 m.



Novgorod.

s.s.e. of St. Petersburg; founded by Rurik 864, and long the capital; populous and important till 1471. The city had in the 14th century a population of ab. 100,000, and maintained its independence against the Germans and Swedes. It was conquered and devastated by the Moscow Tsars 1570. Pop., 1890, 20,599.

**Novi.** Town of n.w. Italy, 30 m. n.w. of Genoa; scene of a French defeat Aug. 15, and victory Nov. 6, 1799. Pop. ab. 10,000.

**Novice.** Embryo nun or monk, who has not yet taken the vows.

**Novikov,** NIKOLAI IVANOVICH, 1744–1818. Russian journalist and compiler, who did much to promote a national spirit; imprisoned for supposed liberalism 1790–96.

**Novius.** Roman author of ab. 40 "Atellanæ" comedies, ab. 100 B.C. Fragments survive.

**Novorossisk.** Seaport of Russia on the Black Sea. Pop., 1893, 28,000.

**Novotcherkask.** Capital of the Cossack province, s. Russia; on a branch of the Don; built 1805. Pop., 1890, 38,476.

**Novum Organum.** Chief work of Bacon 1620; important in the history of inductive philosophy.

**Noy,** WILLIAM. 1577–1634. Atty.-gen. of England 1631–34. *Legal Maxims*, 1641; *Compleat Lawyer*, 1651.

**Noyades.** Cruel device of Carrier during the reign of terror in France, to suppress the reaction at Nantes. In Oct. 1793, a vessel with a trap-door in the bottom was crowded with victims, and sunk in the Loire by night. The act was 25 times repeated. See NANTES.

**Noyau.** Liqueur made by distilling alcohol with orange-peel and peach-kernels, water and sugar being added to the product.

**Noyes,** EDWARD FOLLENSBEE, b. 1832. Gov. of Ohio 1871–74; U. S. Minister to France 1877–81.

**Noyes,** GEORGE RAPALL, D.D., 1798–1868. Prof. Harvard 1840. He tr. and annotated the O. T. poetical and prophetical books 1827–40, and the N. T. 1868.

**Noyes,** HENRY DRURY, M.D., b. 1832. Prof. Bellevue, N.Y., since 1864. *Diseases of the Eye*, 1881–90.

**Noyes,** JOHN HUMPHREY, 1811–1886. American lawyer and preacher, founder, in 1838, of a Perfectionist sect, which later became the ONEIDA COMMUNITY (q.v.).

**Noyes,** WILLIAM CURTIS, LL.D., 1805–1864. Commissioner to codify N. Y. laws 1857–64. *Law of Alluvion*, 1862; *Law of Charitable Uses*, 1861.

**Nozzles.** Smooth nozzles have a conical frustum provided with a cylindrical tip. Ring nozzles have the orifice contracted with an annular ring. Ball nozzles have a bell-shaped orifice contracted by a ball, which causes the jet to spread. Smooth nozzles give 97 per cent of the theoretic discharge and ring nozzles 74 per cent, but the height of the jet is nearly the same. See FIRE ENGINE, STEAM.

**Nu.** Primitive god of ancient Egypt, father of deities and author of the universe.

**Nubia.** Imperfectly defined region n.w. of Abyssinia; held by Egypt till 1881, and since by the MAHDI (q.v.).

**Nubians.** Negroes of mixed blood, living n. of Abyssinia and in upper Egypt. They are fair artisans and soldiers, much in demand by the Egyptians.

Group of Nubian Women.

**Nubti.** Egyptian king of the Hyksos dynasty, ab. 2000 B.C.

**Nucellus.** Central highly protoplasmic cellular mass of the ovule; also known as the nucleus of the ovule.

**Nuciferous.** Nut-bearing plants.

**Nuclear Plate.** Equatorial plate during early stages of metakinesis. See INDIRECT CELL-DIVISION.

**Nuclein.** $C_{29}H_{49}N_9P_3O_{22}$. Substance found in the nucleus of vegetable cells.

**Nucleobranchiata.** See HETEROPODA.

**Nucleololus.** Nucleus of a nucleolus.

**Nucleolus.** Minute, rounded, protoplasmic body, found within the nucleus of cells.

**Nucleoplasm.** Protoplasm which makes up a nucleus; sometimes only the chromatin in the nucleus.

**Nucleus.** 1. The Madreporite. 2. Embryonic shell which forms the umbo of adult molluscan shells. 3. Compact mass formed, in Tunicates, of the digestive and generative glands. 4. Cytoblast or cell-nucleus which may be a solid or vesicular body containing chromatic bodies (nucleoli) and a chromatic and an achromatic reticulum. It undergoes interesting transformations during cell-multiplication or cell-reproduction. See INDIRECT CELL-DIVISION.—In Botany, protoplasmic body of oblong or spherical form, occurring in cells of plants; also central portion of the ovules, and center of a starch-grain.

**Nucleus** OF A COMET. Small star-like point at center of comet; possibly solid, but not probably.

**Nucule.** Archegonium in *Characeæ*.

**Nuda.** See AMŒBINA.

**Nudibranchiata** (DERMATOBRANCHIA or NON-PALLIATA). Sub-order of *Opisthobranchiata*, including marine Gastropods, without shell or mantle. The gills project freely on the back and may contain prolongations of the digestive tract as in the *Eolidæ*. Here are included two sub-divisions, the *Pygobranchia* and *Ailobranchia*.

**Nueces.** River heading in s. Texas and flowing s.e. to the Gulf of Mexico. Drainage area 18,944 sq. m., length 400 m.

**Nuisance.** Act unlawfully disturbing the enjoyment of private property or of common rights. The former is a private nuisance, remediable in a civil action by the injured party; the latter ordinarily sustains only a public prosecution. A private nuisance may be abated by the injured party without suit.

**Nullification.** Constitutional right of a State to declare void an act of Federal legislation; doctrine adopted by Calhoun. Its practical application to the Tariff laws by S. Carolina in 1832 was suppressed by the firmness of Gen. Jackson. The secession of the Southern States was the natural result of this doctrine, which was laid low by the war of 1861–65.

**Nullipores.** See CORALLINES.

**Numantia.** Celtiberian capital in n. Hispania, on the Durius; repeatedly attacked by the Romans; defended by 8,000 against 60,000 through a siege of 15 months; destroyed by Scipio 134 B.C.

**Numa Pompilius.** Second legendary king of Rome 716–673 B.C.; famed for wisdom and piety; revered as author of a religious system which he professed to have received from the nymph Egeria.

**Number.** Unit or collection of units; expression of the relation of quantities to others of the same kind. The base of all numbers is unity, which expresses the equality of quantities compared. Integral numbers are those in which a unit is repeated without separation: fractional numbers are those in which the unit of the kind is divided so that its parts become fractional units. Mixed numbers are those aggregated of different units.

**Number,** IN GRAMMAR. Change in substantive or verbal forms, originally by a suffix, to indicate their singular, dual, or plural relations. Earliest English had dual forms of the pronouns, which lingered until ab. 1300.

**Number Forms.** Patterns in which certain people always imagine or visualize numbers; *e.g.*, when any one possessed of a number form thinks of a series of numerals, they will show themselves in a definite arrangement in a definite position in his mental field of view, and this arrangement and position always remain constant, relative to the direction in which he is looking at the moment. These forms differ for different persons, but usually remain the same through life for any given individual.

**Numbers.** 4th O. T. book, containing statistics of the Israelites in the wilderness.

**Numbers,** BERNOUILLI'S. Arrangement in series of the exponents of the variable and the numerators and denominators of the coefficients in the development of $f(x)=\frac{1}{e^x-1}$

**Numbers,** POLYGONAL. Certain series of numbers, formed from an arithmetical progression by consecutive addition of each term in the polygonal series to the succeeding arithmetical term; *e.g.*,

1. 3. 5. 7. 9. . . . . form an arithmetical series;
1+3 4+5 9+7 16+9
1. 4. 9. 16. 25. form a polygonal series.

These series are called polygonal because the numbers represented by points can be so arranged as to form polygons. The order of polygon formed is indicated by the second term of the series; the example given will form squares, as,

. . . .
. . . . . .
. . . . . .
. . . . . .

**Numenius,** 2d cent. Neo-Pythagorean philosopher.

**Numerator.** Figure indicating number of fractional units divided by a denominator expressed or implied; *e.g.*, $\frac{3}{10}$ or .3.

**Numerianus,** MARCUS AURELIANUS, 254–289. Second son of Carus; Cæsar 282; Emperor, with Carinus, 283.

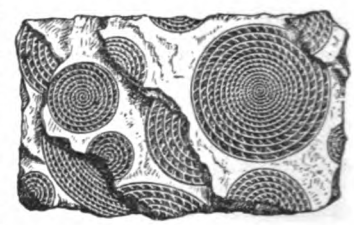
**Numerical.** Relating to numbers; exclusive of any notion but mere magnitude, as : — 5 numerically greater than — 2, though algebraically less. A numerical equation is one in which all known quantities are represented by numbers.

**Numidia.** Ancient country of n. Africa, e. of Mauretania; now e. part of Algeria; kingdom under Massinissa ab. 200 B.C.; Roman province 46 B.C.

**Numismatics.** Study of coins, embracing the metallic money of all countries from its beginning, ab. 700 B.C. The chief departments are (1) Greek, including over 1,000 cities and 300 kings or tyrants, besides the issues of Phœnicia, Persia, and other parts of the world before or beyond the Roman conquests; (2) Roman Republic and Empire; (3) Mediæval; (4) Modern. Medals, tokens, and jelons are also usually embraced. For the past 300 years private and public collections have existed in every civilized land, and books have been pub. on every portion of the subject. The study is important as contributing to our knowledge of history, and incidentally to that of art.

**Nummulinidea.** Order of perforate *Foraminifera*, including Nummulites and similar forms.

**Nummulites.** Genus of large, disk-shaped *Reticularia* (*Foraminifera*). The shell is marked with concentric circles and curved radiating lines, that mark out partitions between the numerous chambers. These shells constitute a large portion of some limestones. They are the largest of Protozoan remains, unless Eozoön should prove to be a genuine Protozoön. The shell contains an outer supplemental deposit, and all the walls are perforated by a canal system. They abound in the middle Eocene of n. Africa and the s. half of Europe and Asia.



Nummulites.

**Nunatak.** Island of rock rising through the sea of ice, such as the well-known Jardin in the Mer-de-Glâce.

**Nunc Dimittis.** Canticle of St. Simeon (Luke ii. 29–32), sung at Vespers or Compline for many centuries.

**Nuncio.** Papal ambassador to any government. See LEGATE.

**Nuncomar,** or NAND KUMAR. Rajah, deputy Nawáb of Murshidabad, India. Treacherous and corrupt official employed by WARREN HASTINGS (q.v.) in his suit against certain fiscal ministers of Bengal, and who afterward became his enemy. He was executed for forgery 1775.

**Nunez,** RAFAEL, 1825–1894. Pres. of Colombia 1880–82 and from 1884; journalist and poet.

**Nunez de Arce,** GASPAR, b. 1834. Spanish poet, dramatist, and minister of state.

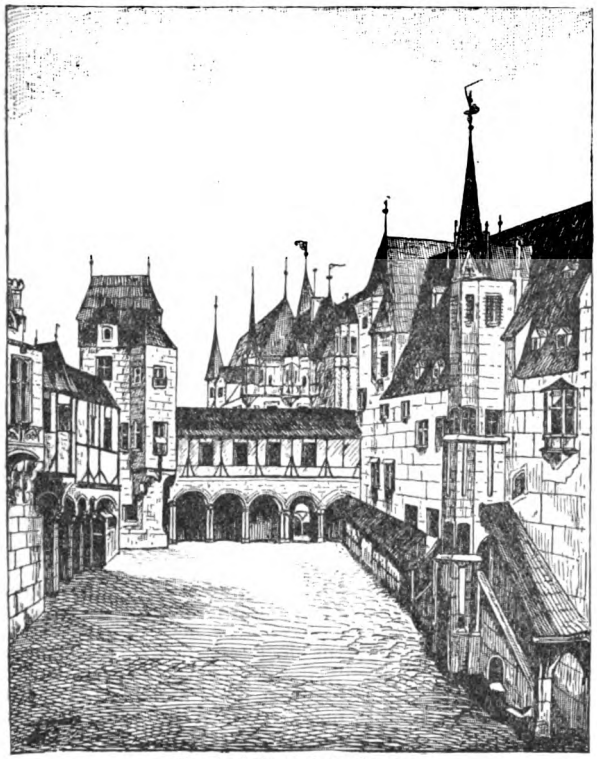
**Nunez-Vela,** BLASCO, d. 1546. Viceroy of Peru 1544; defeated by G. Pizarro, and murdered.

**Nunnery,** or CONVENT. Establishment for the religious retirement of women, the head of the house being called Mother Superior or Reverend Mother. The Benedictines and Cistercians applied the terms Monastery, Abbey, and Priory both to the houses devoted to monks and those devoted to nuns, the Abbess and Prioress being the heads of their respective houses. The first monastery was a collection of huts near Memphis, Egypt, founded by Antony of Thebes, St. Antony, ab. 305; and his first disciple, Pachomius, ab. 350, built, for his sister and her friends, the first convent, on an island in the Nile. The great accumulation of wealth by these R. C. institutions in England caused their suppression and confiscation, which was commenced by Cardinal Wolsey and Henry VIII., and completed 1539, the properties passing to the crown, the nobility, and the gentry, a small proportion being devoted to Protestant church purposes. The monastic institutions were suppressed in France at the Revolution, in Spain 1835, in Portugal 1834, in Italy 1866–70, and in Prussia 1875, except those devoted to nursing, but in 1887 the last permitted some re-establishment. After the Restoration in France many orders were revived, but in 1880 unauthorized orders were suppressed.

including 14,000 monks and nuns out of a total of 25,000. There are many establishments in Austria, Belgium, and Switzerland, and in Great Britain and U. S. they have made much progress; in the latter country there are 50 orders. The Benedictines were founded 529, Cistercians 1098, Ursulines 1537, Sisters of Charity 1629, and Sisters of Mercy 1827.

**Nureddin Mahmud** (MALEK AL-ADEL), 1117–1173. Sultan of Syria, most of which he conquered, defeating the Crusaders in many battles; a ruler of high character and eminent ability.

**Nuremberg** (NÜRNBERG). City of Bavaria, on the Pegnitz; known from ab.1050; free imperial city from 1219; long rich and prominent; independent till 1806; noted for its medi-



Court of Nuremberg Castle.

æval buildings and its productions in carvings in metals and wood and toys. It was besieged by Wallenstein 1632, and suffered heavily. It has a large commerce and varied manufactures. Pop., 1890, 142,590.

**Nuremberg,** PEACE OF. Aug. 21, 1532. The Protestant princes of Germany agreed to support Ferdinand I. against the Turks, and he to abrogate the edicts of Worms and Augsburg, allowing Protestants temporary free exercise of religion.

**Nurhag,** or NURAGHE. Round tower from 20–60 ft. in diameter and 30–40 ft. high, with two or three stories, peculiar to Sardinia. There are 3,000, and are of supposed Phœnician origin.

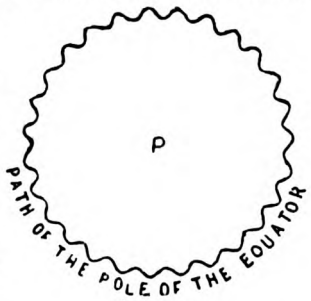
**Nursery Rhymes.** The collection and study of nursery rhymes has been extensively prosecuted as a branch of folklore in various countries. While voluminous collections have been made and curious parallels drawn, the scientific results are as yet meager.

**Nursing.** Needed attention paid to the sick or injured for their comfort and care. Naturally hospitals and asylums offer greater opportunities for this service, where, formerly, it was performed exclusively by members of religious orders. In army hospitals the custom varied, some nations detailing soldiers, others permitting the nuns to minister here as well. Later, in many hospitals, nurses were but more or less carefully selected servants. Frequently the only qualification of professed nurses out of hospitals was their profession. Florence Nightingale's ministrations during the Crimean War, 1854–56, afforded a stimulus to bring about the proper training of nurses. Now our hospitals are served by trained nurses, and these are available for the sick in our homes as well. The schools for training nurses, usually for young women, are connected with a number of hospitals, where a course of two or more years is given combining theoretic instruction with practical training in the wards.

**Nusairich,** or ANSONIANS. Mussulman sect inhabiting the lower Ansyrean mountains. They keep their creed secret, and many of their doctrines are unknown.

**Nut.** Indehiscent, one-seeded, dry fruit, with a hard, horny pericarp, as in the filbert and walnut.

**Nutation.** That of the earth's axis is an oscillation due to the lack of uniformity in the motion of precession. See CIRCUMNUTATION.



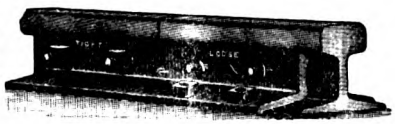

Nutation.

**Nutgalls.** Excrescences growing on certain oaks, due to punctures by insects. They consist largely (50 to 75 per cent) of tannin, and are one of the sources for its production.

**Nut Grass.** *Cyperus rotundus.* Plant of the Sedge family, bearing small round tubers; native of warm, temperate regions.

**Nuthatch.** Some of them belong to the JAYS (q.v.). They feed on insects and seeds of pine cones. Of true nuthatches we have the genus *Sitta*, bluish-gray above and white or reddish (according to species) below. They resemble the woodpecker, but lack the stiff tail feathers. The nuts on which they feed are hatched or cut open in clefts of trees by their bills. See TENUIROSTRES.

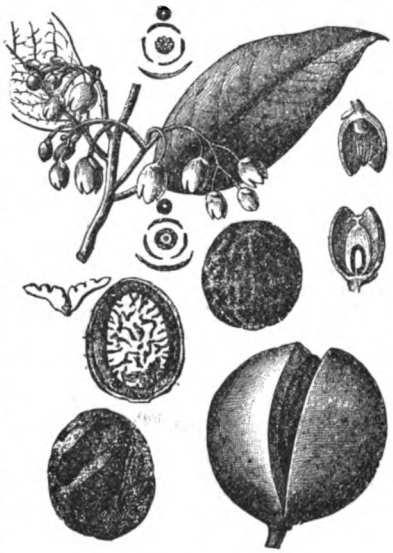
**Nutlet.** Hard, seed-like fruits borne by plants of the Borage family, Verbena, and some others: also small nuts.



Nut Lock.

**Nut Lock.** Devise to prevent a nut from becoming loosened; consisting of a bent washer or a spring for receiving the shocks, which thus cannot be communicated to the nut.

**Nutmeg.** *Myristica fragrans.* Small tree of the natural family *Myristiceæ*, native of the E. Indies; extensively cultivated for its fruit, the size of a walnut, whose kernel yields the nutmegs, and whose aril, or seed covering, the mace of commerce. The fruits of some trees of the Laurel family are so called.



Nutmeg (*Myristica fragrans*).

**Nutmeg,** CALIFORNIAN. *Tumion californicum.* Small tree of the natural family *Coniferæ*, native of California. Its fruit resembles a nutmeg in shape; the foliage has a disagreeable odor.

**Nutrition.** Complex physiologic process by which the digested food that has entered the circulation is taken up and assimilated by the various tissues, becoming a part of the cell of which the tissue is composed and entering into the function of the tissue. It is the last of the metabolic changes transforming food into living matter.

**Nutritive Pole** (VEGETATIVE POLE). That pole of eggs, where the most yolk (nutritive yolk or deuteroplasm) is present. This is the pole at which the macromeres appear, and where the secondary blastopore of meroblastic eggs is formed at the close epibolic invagination.

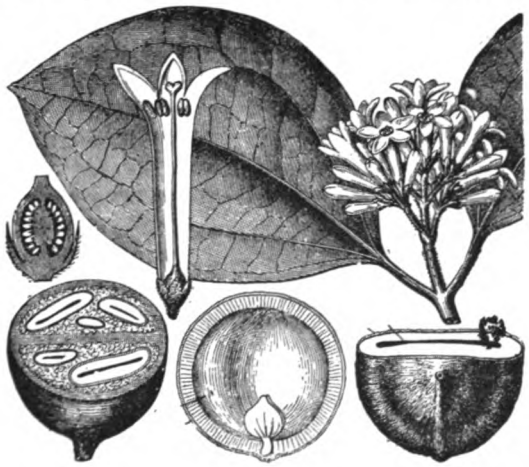
**Nutritive Polyp.** One whose function it is to receive and digest food for a hydroid colony of which it is a part or zoöid.

**Nutritive Ratio.** Relation of the digestible portion of the protein substances to the fats, nitrogen-free extract, and fiber, in a fodder or ration. In calculating it the fat is multiplied by two and a half, since it has nearly two and a half times the heat-producing power of the carbhydrates. The ratio is found by adding to the digestible portion of the fiber and nitrogen-free extract two and a half times the digestible fat, and dividing by the digestible protein. The result is always expressed as a ratio with the protein as a unit, thus: as 1: (?).

**Nut-Rush.** Sedges of the genus *Scleria*, bearing hard, stony achenia, of wide geographical distribution.

**Nuttall,** THOMAS, 1786–1859. English botanist, in America 1822–42. *Genera of North American Plants*, 1817–18; *North American Sylva*, 1842–54.

**Nux Vomica.** *Strychnos nux vomica.* Small tree of the natural family *Loganiaceæ*, native of the E. Indies; widely



Nux Vomica.

cultivated for its seeds, from which the poisonous alkaloids Strychnine and Brucine are derived. They contain .3 to .5 per cent of the former.

**Nyanza.** See ALBERT NYANZA and VICTORIA NYANZA.

**Nyassa.** Lake of s.e. Africa, drained by the river Shire to the Zambesi; ab. 350 by 25 m. Area ab. 14,200 sq. m.

**Nyāya Philosophy.** One of the six systems of Brahmanical philosophy, supposed to have been founded some time after the birth of Christ.

**Nyblom,** KARL RUPERT, Ph.D., b. 1832. Swedish poet and translator, prof. Upsala since 1860.

**Nybom,** JOHAN, b. 1815. Swedish poet.

**Nyctaginaceæ.** Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Dicotyledons*, comprising 25 genera and ab. 120 species, mostly herbs, occurring in the tropics and warm regions of the whole world, especially in America; called the Four O'Clock family.

**Nyctalopia.** Word of disputed derivation and, unfortunately, used by different authors to designate diametrically opposite conditions. By far the most common use of the word is to describe a rarely found abnormal condition of sight where a person is able to see more clearly in comparative darkness than in the light.

**Nycteridæ.** See BATS.

**Nyctipithecus.** Genus of small S. American monkeys, resembling the Old World Lemurs. They sleep by day, and at night catch insects for food. They are easily tamed, and are useful pets. See PLATYRRHINA.

**Nyctotropic.** Sleep movements of the leaves or other organs of certain plants, closing when darkness approaches and opening on the return of light.

**Nye,** EDGAR WILSON ("BILL NYE"), 1850–1896. American humorist, widely known through newspapers and as a lecturer. *Baled Hay*, 1884; *Comic History U. S.*, 1893.

**Nye,** JAMES WARREN, 1814–1876. Gov. of Nevada 1861–65; U. S. Senator 1865–73.

**Nyerup,** RASMUS, 1759–1829. Danish antiquarian.

**Nylander,** WILHELM, b. 1823. Prof. of Botany at Helsingfors. *Prodromus Lichenographiæ Galliæ et Algeriæ*, 1857; *Synopsis methodica Lichenum*, 1858–59; *Lichenes Scandinaviæ*, 1861.

**Nymph.** Active pupa of insects.

**Nymphæaceæ.** Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Dicotyledons*, comprising 8 genera and ab. 30 species of aquatic herbs, growing in all parts of the world; called the Water-Lily family.

**Nymphenburg,** TREATY OF. Signed by Spain, France, Bavaria, and Saxony, May 1741; for division of Austrian dominions. See BRESLAU.

**Nymphs.** Inferior female divinities. The Oceanides were nymphs of the ocean; Nereids, of the Mediterranean; Naiads, of fresh water, as rivers, lakes, springs; Oreads, of mountains and grottoes; Dryads and Hamodryads, of trees, and believed to die with the trees in which they had lived. There were also nymphs of glens and of special localities. They were endowed with prophetic power, and able to inspire men.

**Nymphs,** GROTTO OF THE. Found on the island of CAPRI (q.v.).

**Nymwegen.** See NIMEGUEN.

**Nyout.** One of the national games of Corea, played by two or more persons upon a circular diagram with an internal cross, with pieces or men called horses, according to the throws with four two-faced staves or blocks of wood. The terminology of the game is Ural-Altaic, and it is clearly a foreign introduction into e. Asia. It is identical in almost every particular with a game common to many tribes of the American Indians and played upon a similar diagram according to throws with staves. From these games it is clear that Nyout is cosmical and divinatory in its origin. It may be regarded as the antetype of many games played on diagrams, as backgammon and chess. See GOOSE.

**Nystadt** (FINLAND), PEACE OF. Aug. 30, 1721. It ended the northern war, Sweden ceding certain territories to Russia.

# O

**Oahu.** Most populous and second in size of the Hawaiian Islands. Honolulu is situated on it. Area 649 sq. m.

**Oak.** Trees and shrubs of the genus *Quercus*, natural family *Fagaceæ*, of wide geographical distribution, bearing acorns as fruit and producing valuable timber, the mean compressive strength of which is 7,000, and the mean tensile strength 10,000 lbs. per sq. in. of cross-section.

**Oak**, POISON. See IVY, POISON.

**Oak Galls.** See GALLICOLA.

**Oakland.** Capital of Alameda co., Cal., on e. shore of San Francisco Bay, opposite San Francisco, of which it is a suburb. Pop., 1890, 48,682.

**Oak Lungs.** Same as LUNGWORT (q.v.).

**Oakum.** Junk or old ropes untwisted. It is used in CALKING (q.v.). The teasing of oakum is frequently the work of prisoners.

**Oannes.** Babylonian god resembling Dagon of the Philistines.

**Oasis.** Fertile spot in a desert, produced by a well or spring. They are also made by artesian wells.

**Oates,** TITUS, ab.1650–1705. English discoverer or inventor of an alleged Popish plot, which caused wild excitement and

Oates in the Pillory (from a Contemporary Print).

many executions 1678, for which discovery he was pensioned; fined £100,000 for calling the Duke of York a traitor 1683, pilloried and whipped for perjury 1685, in prison till 1688.

**Oat-Grass,** BLACK. *Stipa avenacea.* E. American wood grass.

**Oath.** Calling God to witness the truth of a promise or assertion. Unless a statute specifies a form, that form is employed which the taker considers most binding on his conscience. In Gt. Britain and in many of the U. S., affirmations or declarations have been substituted for oaths, and atheists are no longer disqualified as witnesses or officeholders.

**Oaths,** MILITARY. In the conduct of military affairs, oaths are administered to every soldier and to every officer of U. S. Army; also to the members of a court-martial.

**Oats.** *Avena sativa.* Tall, annual grass, supposed to be native of n. Asia, widely cultivated for its grain in all cool temperate regions. Oats thrive best on a cool, moist, strong soil. They should be sown as early in the spring as the ground can be fitted, the main points of successful culture being early sowing and well prepared soil. When sown late, the crop is much more likely to suffer from rust, which in turn causes light kernels. The production, 1895, in the U. S. was 824,443,537 bushels, Iowa leading with 182,967,338 bushels.

**Oaxaca.** Capital of the state of O., Mexico, on the Rio Verde. Pop. ab. 28,500.

**Ob,** or OBI. River of w. Siberia. It rises in the Altai Mts., and flows n.w. and n. to the Gulf of Obi. Its principal branch is the Irtish. Length 2,500 m.; drainage area 1,250,000 sq. m., about the same as that of the Mississippi.

**Obadiah.** 1. Jewish prophet, author of 31st and shortest O. T. book, probably ab. 585 B.C. 2. Officer of Ahab, who saved 150 prophets.

**Obando,** JOSÉ MARIA, 1797–1861. Pres. of New Granada 1853–54.

**Obdiplostemonous.** Flowers having two sets of stamens, the outer set opposite the petals.

**Obe.** See OBI.

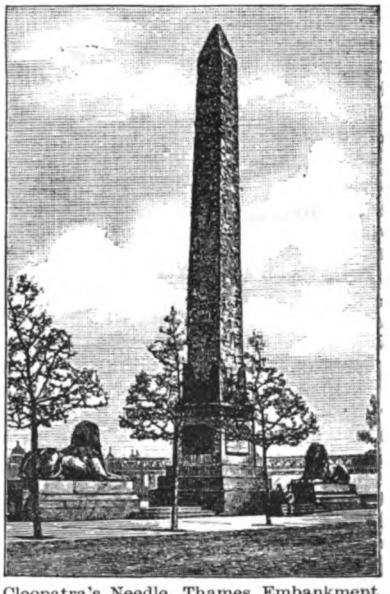
**Obedience.** Willing conformity to law or rules, imposed by authority.

**Obedient Plant.** *Physostegia virginiana.* Showy-flowered plant of the Mint family, the blossoms remaining in any position to which they are moved; native of the e. U. S.; known as False Dragon-Head.

**Obeid,** EL. Capital of Kordofan, e. Soudan, 220 m. s.w. of Khartoum; a populous commercial center till 1882. Near it Hicks and his Egyptian army were destroyed by Mahdists 1883.

**Obeisance.** A reverential gesture of the head or knee, surviving as an act of courtesy from religious or ceremonial prostration expressive of physical submission.

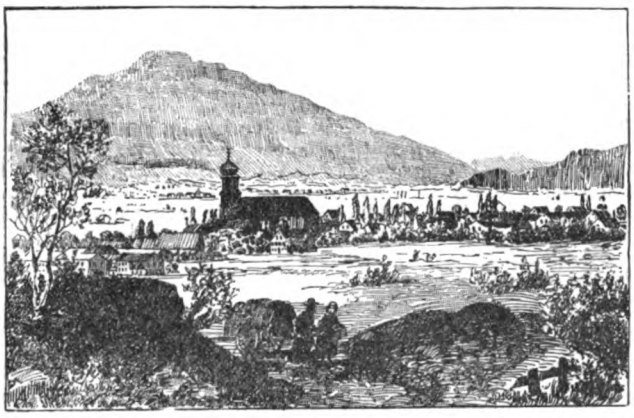
**Obelisk.** Upright stone pillar, four-sided, with sides slightly converging and terminating in a pyramid-shaped top. The height is ab. 10 times the diameter at the base. The form is distinctive for Egypt and when otherwise formed in modern art, as in the Washington Monument, is thence derived. In Egypt the obelisks were always solid blocks of stone, placed on a cubical pedestal, stood in pairs flanking a temple entrance, and were covered with hieroglyphic inscriptions. They were for sun-worship, and an Old Empire stele in the Gizeh Museum proves that they sometimes supported globes representing the sun. Only three obelisks now stand upright in Egypt of this form. There are several obelisks now in Rome; the largest is the Lateran, originally at Thebes: it is 105½ ft. high, 9 ft. 10 in. square at base, and weighs 1,020,000 lbs. Another stands on the Place de la Con-



Cleopatra's Needle, Thames Embankment, London.

corde at Paris. Two others, formerly at Heliopolis, were carried to Alexandria by Rameses II. One of these stands on the Thames embankment in London since 1878; wt. 186 tons, height 68½ ft. The other, 69½ ft. high, 7 ft. 9 in. square at base, wt. 448,000 lbs., was erected in Central Park, New York, 1881. Another form of the obelisk was flat and slab-shaped, with a rounding top. Only two of these are known in Egypt: they stand before the small Pyramid temple at Medum, excavated by Petrie 1891. There are several of this shape at Axum in Ethiopia.

**Oberammergau.** Village of Upper Bavaria, noted for the Passion Plays presented here every 10 years, because of a vow made by the inhabitants 1633. The performance includes scenes from the life of Christ and typical events from O.T., in-



Oberammergau.

volves over 500 characters, and occupies ab. 7½ hours. It is given in summer in an open-air theater seating 6,000 persons, is directed by the parish priest, and is regarded as an act of worship.

**Oberge,** EILHARD VON, ab.1160–ab.1210. German epic poet, who versified the legend of *Tristan and Isolde.* Fragments only survive.

**Oberhausen.** Prussian town 20 m. n. of Dusseldorf. It has zinc smelting works and manufactures of glass and porcelain. Pop., 1890, 25,200.

**Oberlin,** JEAN FRÉDÉRIC, 1740–1826. Protestant pastor of the Steinthal, in Alsace, from 1767; evangelist and civilizer of a wild region and a rough people.

**Oberlin College.** At Oberlin, O.; established 1833 as Collegiate Institute: name changed 1850. It has always admitted both sexes and all colors. The theol. sem. was opened 1835. There are 35 professors, 53 assistants and lecturers, 439 students in the collegiate and 469 in academic courses, with 64 in theology; total, including music, 1,411. The libraries contain 45,000 vols.

**Obermann.** See SÉNANCOUR.

**Oberon.** King of the fairies; celebrated in a French poem ab. 1250; known in English literature since ab. 1525, and chiefly through *Midsummer Night's Dream.*

**Obersteiner,** HEINRICH, b. 1847. Prof. Vienna 1880; writer on mental disorders.

**Obesa.** See HIPPOPOTAMIDÆ.

**Obesity.** Excessive corpulence. The treatment consists in a regulated diet diminishing the amount of fats and starches with, if possible, increased exercise. See BANTINGISM and DANIEL LAMBERT.

**Obi.** System of sorcery found among the blacks of the W. Indies and in some parts of the U. S.; probably brought from Africa. The obeahmen make use of various kinds of fetishes, blood, feathers, dogs' or alligators' teeth, etc.

**Obi,** GULF OF. Arm of the Arctic Ocean, in n.w. Siberia.

**Obiism.** The witchcraft or sorcery of the African negroes. Practiced by native priests or witch-doctors, commonly called Obi men, who by magical devices, such as incantations, charms, and fetiches, pretend to cure diseases, expel evil spirits, compel affections, or work harm. It is reported as existing among the negroes of the West Indies and the U. S., and its rites, in Hayti and San Domingo, are said to be accompanied with orgies and human sacrifices.

**Obi River.** See OB.

**Obiter Dictum.** Judicial statement not necessary to the decision of the case at issue. It is not binding on inferior tribunals.

**Object,** and OBJECTIVE. Sometimes the external thing of which we are conscious in sense perception; sometimes any event, whether mental or physical, about which the mind is occupied. "Objective" sometimes adds the notion of universal, or of what is true of other persons besides the subject, and thus external to the subject, but not external to all consciousness.

**Object-Glass,** or OBJECTIVE. Lens furthest from the eye in a telescope or microscope. Its function is to form a real image of the object, this image being magnified by the eyepiece. Object-glasses are converging and achromatic: in the case of the telescope they are made very large, to utilize as much light as possible. The great refractor at the Washington Observatory has an aperture of 26 in., that of the Lick Observatory, Cal., 36 in., and that of the Yerkes Observatory, Chicago Univ., 41⅜ in. These were all made by Alvan Clark & Sons, Cambridge, Mass. The glass plates were imported. The cost of those for the Yerkes lenses was $40,000; of the finished lenses $100,000. The convex lens of crown glass is 3 in. thick at the center, 1¼ in. at the edge, and weighs 205 lbs.; the concave lens of flint glass weighs 310 lbs.; with the iron ring and cell the total weight is 1,000 lbs.

**Oblanceolate.** Leaves or other organs inversely lanceolate in outline.

**Oblates.** Members of several R. C. orders, not bound by monastic vows, but lived in community, and were merely held by a promise to do that which the bishop considered to the

Oblates.

interest of religion; instituted by St. Carlo Borromeo at Milan 1578, who used their services in the wild and inaccessible Alpine districts.

**Oblate Spheroid.** Solid formed by the revolution of an ellipse about its minor axis.

**Obligation.** In Roman Law, legal bond whereby one person is bound to render something to another, whether arising by a contract or a delict. If the duty arose not from a contract, but was similar to such a duty, it was called *quasi ex contractu;* if similar to that from a delict, it was *quasi ex delicto.* In English Law, as a generic term, it includes every form of liability enforceable by law: as a specific term, it signifies a sealed contract with a penalty or bond.

**Obligation,** DAYS OF. Those on which faithful Catholics are bound to hear mass and abstain from work. They are Circumcision, Epiphany, Ascension Day, Corpus Christi, SS. Peter and Paul, Assumption, All Saints, and Christmas. In Ireland St. Patrick and Annunciation are added, and in Scotland St. Andrew.

**Obligation of Contracts.** This may not be impaired by State laws or constitutions. It applies to executed as well as to executory contracts, and prevents the repeal or essential modification of a statute which amounts to a contract between the State and a natural or artificial person. It does not apply to divorce statutes, as marriage is a status and thus more than a contract; nor to statutes passed in the exercise of the police power; nor to statutes affecting only the remedy upon contracts.

**Oblique.** Opposed to right. Oblique lines or planes in reference to any base are those not perpendicular. Oblique

angles are those greater or less than 90°. An oblique figure is one whose axis or lateral elements are not perpendicular to the base.

**Oblique Arch.** One whose face is not at right angles to its length. When the obliquity is marked, the stones are laid in spiral courses and their joints are warped surfaces instead of planes. One of the finest oblique arches in the U. S. is a short railroad bridge over a highway at Reading, Pa.

**Oblique Order of Battle.** This brings the line of advance oblique to the defensive position of the enemy, affording a preponderance of strength; the battle of Leuthen was fought by Frederick the Great with the oblique order.

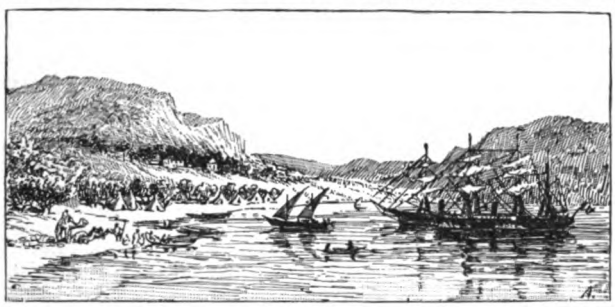
**Oblique Sphere.** Appearance of the celestial sphere as seen from points between the equator and the poles, all the heavenly bodies appearing to move in circles oblique to the horizon.

**Obliquity of the Ecliptic.** Angle between the planes of the ecliptic and equator. Its value is 23° 27′. It is diminishing about half a second annually; this decrease will continue for ab. 15,000 years, after which it will begin to increase.

**Oblong Projectiles.** Upon the introduction of rifled cannon an increase in mass could be obtained with smaller caliber by elongating the projectile. The rifled motion imparted to it around the longer axis gave it stability of rotation, and increased the range. All modern projectiles are of this class.

**Oboe** (HAUTBOY or HAUTBOIS). Orchestral instrument belonging to the family of wood-winds. Its sound, produced by a double reed, has a pastoral character; though practically 200 years old, it is a descendant of the shawm, or shepherd's pipe.

**Obok.** French village in e. Africa at the mouth of the Gulf of Tajurra. Now serves as a military post and coaling



Obok.

station. The harbor is safe and easily accessible, though not spacious. It was ceded to France 1862 and taken possession of 1881.

**Obolus.** Small silver coin of ancient Greece, sixth of a drachma.

**Obovate.** Leaves or other organs which are inversely ovate in outline.

**O'Brien,** FITZ JAMES, 1828–1862. Irish-American author, remembered chiefly for *The Diamond Lens. Poems and Stories*, 1881.

**O'Brien,** WILLIAM, b. 1852. Irish leader, M.P. 1883.

**O'Brien,** WILLIAM SMITH, 1803–1864. M.P. 1826–31 and 1835–48; leader of the Young Ireland party 1846; tried for treason 1848; transported 1849; released 1854.

**Obscurantists.** Name applied to that class of people who oppose the cultivation and diffusion of knowledge, and especially those who defend theological prejudices against scientific truth.

**Obsequens,** JULIUS. Latin compiler of fourth century of *Prodigiorum liber*, events of 190 to 11 B.C., pub. 1508.

**Obsequies.** See DISPOSAL OF THE DEAD and FUNERALS.

**Observants.** Monks and nuns who observe the stricter rule of St. Francis; organized 1368, when the original rule was relaxed.

**Observation,** ARMY OF. An army confined to checking the advance of a hostile force and observing its movements is an army of observation; while an army occupying an enemy's country and establishing itself there for a time is an army of occupation; *e.g.*, Scott's army in Mexico, after the capture of the City of Mexico, and the German army in France after the capitulation of Paris.

**Observatory,** ASTRONOMICAL. Institution for the regular study of the positions, motions, and characteristics of the heavenly bodies. In addition to this the program not infrequently includes observation of terrestrial magnetism, meteorology, and sometimes earthquake phenomena. The only institution corresponding to a modern observatory which existed before the Christian era was that founded at Alexandria by Ptolemy Soter ab. 300 B.C. Observation and investigation were carried on here for ab. 400 years. It was made famous by the work of Claudius Ptolemy and many others of lesser note. During the middle ages observatories were founded at Bagdad in the 9th century, at Mokattam near Cairo ab. 1000, at Merágha in Persia ab. 1260, and at Samarkand in 15th century. At these places observations were carried on with instruments made after the fashion of those used at Alexandria 1,000 years earlier, and, if no great advance was made, the science was at least preserved from extinction. Among the early observatories of Europe the most famous were those of Bernard Walther at Nuremberg 1472, Tycho Brahe on the Danish island of Huen (1576–97), Landgrave William III. at Cassel (1561–97), and Hevelius at Dantzic, 17th century. More recently the number of observatories, both public and private, has become very great. G. H. Boehmer in the Smithsonian report for 1886 gives a list not professing to be complete of 76 American and 265 foreign observatories. The following are some of the more prominent, with names of directors, astronomical position, and most important instruments.

Albany, N. Y. Dudley Observatory. Long. from Washington 0h. 13m. 12.87s. E., lat. 42° 39′ 49.5″ N. Directors: B. A. Gould 1854, O. M. Mitchel 1859, G. H. Hough 1862, L. Boss 1875. Instruments: equatorial refractor by Fitz, 13 in. aperture; meridian circle by Pistor & Martins, 8 in. aperture; transit instrument, Pistor & Martins, 6.4 in. aperture. Recently rebuilt on a new site and provided with a new equatorial by Brashear.

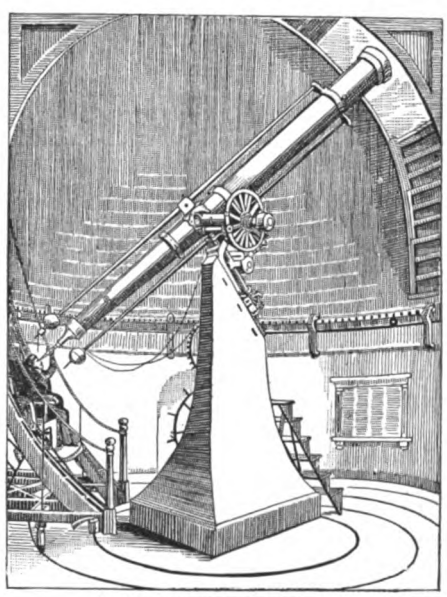
Ann Arbor, Mich. Detroit Observatory. Long. 0h. 26m. 43.10s. W., lat. 42° 16′ 48.0″ N. Directors: F. Brünnow 1854, J. C. Watson 1858, M. W. Harrington 1879, Asaph Hall, Jr., 1892. Instruments: equatorial refractor, 12½ in., by Fitz; meridian circle by Pistor & Martins. Twenty-one minor planets were discovered here by Watson.

Berlin, Prussia. Königliche Universitäts Sternwarte. Long. from Greenwich 0h. 53m. 34.91s. E., lat. 52° 30′ 16.7″ N. Founded 1705. Director: W. J. Foerster. Equatorial refractor by Utzschneider & Fraunhofer, 9 in. aperture; with this instrument Neptune was discovered by Dr. Galle 1846; a meridian circle by Pistor & Martins, 4 in. aperture.

Birr Castle, Ireland. Earl of Rosse's Observatory. Long. from Greenwich 0h. 31m. 40.9s. W., lat. 53° 5′ 47″ N. Instruments: the famous reflecting telescopes of 6 ft. and 3 ft. aperture respectively.

Bonn, Prussia. Universitäts Sternwarte. Long. from Greenwich 0h. 28m. 23.29s. E., lat. 50° 43′ 45″ N. Directors: K. D. van Münchow 1818, F. W. A. Argelander 1837, E. Schönfeld 1875, F. Deichmüller 1891, F. Küstner 1891. Meridian circle by Pistor & Martins, 4½ in. aperture; meridian circle by Repsold, 6 in. aperture. This observatory has been very widely known from the work carried on here under the direction of Argelander, the great survey of the northern heavens or "Durchmusterung" being most important.

Cambridge, Mass. Astronomical Observatory of Harvard College. Long. from Washington 0h. 23m. 41.05s. E., lat. 42°



Cambridge (U. S.) Equatorial.

22′ 47.6″ N. Directors: W. C. Bond 1839, G. P. Bond 1859, J. Wenlock 1866, E. C. Pickering 1876. Instruments: equatorial re-

fractor, by Merz, 15 in.; meridian circle, Troughton & Simms, 8½ in. aperture; transit circle, aperture 4½ in; spectroscopes, photometers, and a large collection of photographic instruments, including the great Bruce telescope of 24 in. aperture.

Chapultepec, Mexico. National Observatory. Long. from Washington 1h. 28m. 26.20s. W., lat. 19° 25′ 17.5″ N. A 15-in. equatorial telescope by Grubb is the principal instrument. In 1883 the observatory was transferred to Tacubaya. Long. 1h. 28m. 34.45s. W., lat. 19° 24′ 17.5″ N.

Chicago, Ill. Yerkes Observatory. Department of the Univ. of Chicago. The site is on the shore of Lake Geneva, Wis., 72 m. from Chicago. The principal instrument will be the 41⅜-in. equatorial by Alvan Clark & Sons, mounting by Warner & Swasey, the largest refracting telescope ever constructed. It will be provided with several smaller telescopes, transits, meridian circles; in short, everything necessary to an observatory of the highest rank.

Clinton, N. Y. Litchfield Observatory of Hamilton Coll. Long. from Washington 0h. 6m. 34.65s. E., lat. 43° 3′ 17″ N. Director, C. H. F. Peters, 1858–1890. Equatorial telescope, by Spencer & Eaton, 13½ in. aperture. With this instrument Dr. Peters discovered 52 minor planets.

Cordoba, Argentine Republic. National Observatory. Long. from Washington 0h. 51m. 23.84s. E., lat. 31° 25′ 15.5″ S. Directors: B. A. Gould 1870, John M. Thome 1884. Equatorial telescope, by Fitz, 11 in.; meridian circle, by Repsold, 5 in. aperture. With the latter instrument 105,000 observations were made for Dr. Gould's catalogue of southern stars.

Greenwich, England. Royal Observatory. Long. from Washington 5h. 8m. 12.04s. E., lat. 51° 28′ 38.4″ N. Directors: J. Flamsteed 1675, E. Halley 1720, J. Bradley 1742, N. Bliss 1762, N. Maskelyne 1765, J. Pond 1811, G. B. Airy 1835, W. H. M. Christie 1881. There was an equatorial of 12.8 in., mounted on the English plan, replaced 1893 by one of 28 in., by Grubb; a meridian circle of 8 in. aperture, by Simms, and Ransomes & May, and an altazimuth, by the same, with 3-ft. circles and 4-in. telescope.

Observatory of Greenwich; built by Charles II. 1675.

Königsberg, Prussia. Universitäts Sternwarte. Long. from Greenwich 1h. 21m. 58.91s. E., lat. 54° 42′ 50.6″ N. This observatory is chiefly known in connection with the celebrated researches of F. W. Bessel, which were carried on here from 1813 until his death in 1846. Present director, C. W. F. Peters.

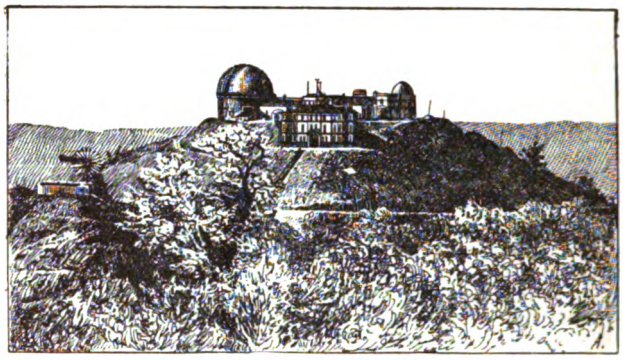
Leyden, Holland. University Observatory. Long. from Greenwich 0h. 17m. 56.35s. E., lat. 52° 9′ 20″ N. Founded 1632, it is the oldest existing observatory in Europe. A new building was erected 1858–60 and provided with a 7-in. refractor by Merz, and a meridian circle by Pistor & Martins, 6.3 in. aperture.

London, Ealing. A. A. Camneau's Observatory. Two reflectors of 60 and 18 in. aperture respectively are employed chiefly for celestial photography and spectroscopy.

London, Upper Tulse Hill. Huggins Observatory. Long. from Greenwich 0h. 0m. 27.7s. W., lat. 51° 26′ 47″ N. A 15-in. refractor and a Cassegrain reflector, both by Grubb, are employed on the same equatorial mounting. With these instruments Huggins has conducted his well-known spectroscopic researches.

Meudon, France. Long. from Greenwich 0h. 8m. 55.6s. E., lat. 48° 48′ 18″ N. Director, J. Janssen. Devoted to astronomical physics, especially to photography. It contains, among other powerful instruments, a reflector of one meter aperture.

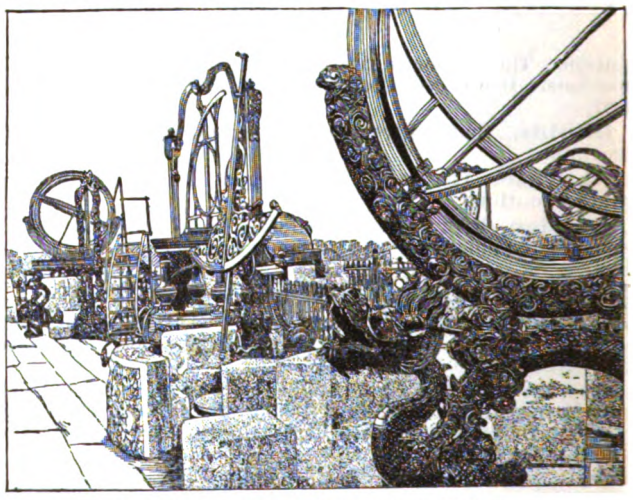
Mount Hamilton, Cal. Lick Observatory. Long. from Washington 2h. 58m. 22.05s. W., lat. 37° 20′ 23.5″ N. Director, Edward S. Holden 1885. Equatorial telescope, 36 in., by Alvan Clark & Sons; equatorial telescope, 12 in., by Alvan Clark & Sons; meridian circle, by Repsold, 6 in. aperture; a great variety of minor instruments.



Lick Observatory.

Paris, France. National Observatory. Long. from Greenwich 0h. 9m. 20.95s. E., lat. 48° 50′ 11.87″ N. Directors: J. D. Cassini 1671, J. Cassini 1712, C. F. Cassini 1756, J. D. Cassini 1784, J. J. L. De La Lande 1795, P. Mechain 1801, A. Bouvard 1804, F. J. D. Arago 1830, U. J. J. Le Verrier 1853, C. E. Delaunay 1871, U. J. J. Le Verrier 1872, E. Mouchez 1878, F. F. Tisserand 1892–96. Founded 1667; a huge building, commenced by the architect Perrault, but poorly adapted to the requirements of a modern observatory: the principal instruments are mounted in other structures. These comprise a reflecting telescope of 4 ft. aperture, a refractor of 29 in., a number of smaller refractors, and a meridian circle by Secretan & Eichens, 9.5 in. aperture.

Peking, China. Long. from Greenwich 7h. 45m. 37.02s. E., lat. 39° 54′ 13″ N. Said to have been built 1279; furnished with new instruments by the Jesuit missionaries 1673. It does not appear that anything more modern exists there to-day.



Ancient Astronomical Instruments at Peking.

Princeton, N. J. Halstead Observatory. Long. from Washington 0h. 9m. 34.54s. E., lat. 40° 20′ 57.8″ N. Director, C. A. Young. Equatorial telescope by Alvan Clark & Sons, 23 in. aperture.

Pulkowa, Russia. Nicholas Central Observatory. Long. from Greenwich 2h. 1m. 18.67s. E., lat. 59° 46′ 18.7″ N. Directors: F. G. W. Struve 1835, Otto Struve 1861, Theodore Bredichin 1889. Among the instruments are a refracting telescope by Alvan Clark & Sons, 30 in. aperture, a heliometer, several transits, and meridian circles.

South Bethlehem, Pa. Sayre Observatory of Lehigh Univ. Founded by Robert H. Sayre 1868. Long. from Washington 0h. 6m. 40.19s. E., lat. 40° 36′ 23.9″ N. Directors: C. L. Doolittle

1876, C. L. Thornburg 1896. Instruments: equatorial by Clark, 6 in. aperture; portable transit; clock by Bond; zenith telescope, 3 in. aperture. With the latter several thousand observations have been made for investigating the variation of latitude.

Washington, D. C. U. S. Naval Observatory. Long. from Greenwich 5h. 8m. 12.04s. W., lat. 38° 53′ 38.8″ N. (old observatory); 5h. 8m. 15.71s. W., 38° 55′ 14.7″ N. (new observatory). Directors: M. F. Maury 1841, James M. Gilliss 1861, Charles H. Davis 1865, Benjamin F. Sands 1867, John Rodgers 1874, Stephen C. Rowan 1882, Robert W. Shufeldt 1883, Samuel R. Franklin 1884, George E. Belknap 1885, Allan D. Brown 1886, Robert L. Phythian 1886, F. V. McNair 1890. Equatorial telescopes: aperture 26 in. by Alvan Clark & Sons, remounted by Warner & Swasey; aperture 9.62 in. by Merz; meridian circle by Pistor & Martins, aperture 8.52 in., remodeled by Saegmuller; meridian transit instrument by Ertel & Son, aperture 5.33 in.; mural circle by Troughton & Simms; prime vertical transit instrument, remodeled by Saegmuller. Besides these, there is a large collection of instruments of less prominence. In 1892 the observatory was removed to a new site. The main building of the new establishment is an imposing structure of marble containing the offices, computing rooms and library. A separate building is provided for each of the principal instruments; those containing the meridian instruments are of iron. The cost, including repairing and remounting of instruments, was more than $500,000.

**Obsidian.** Natural volcanic glass, formed in the rapid cooling of some varieties of lava; formerly used in many parts of the world for arrow- and spear-heads. When delicately colored or marked, it is used to some extent in jewelry.

**Obstetrics.** (Synon. MIDWIFERY.) The branch of medicine which treats of the care of woman in pregnancy, childbirth, and the puerperal state. A male practitioner of obstetrics is known as an obstetrician, or by the French name accoucheur; a female who attends childbirth is known as a midwife.

**Obtectæ.** Division of *Diptera*, in which the pupæ are formed in a special case or cocoon. It includes the *Brachycera* and *Nemocera*.

**Obtected.** Insect pupa that, like a chrysalis, secretes a special shell or skin about itself for protection.

**Obtuse Angle.** If plane, or dihedral, greater than a right angle; if polyhedral, having a measure exceeding the tri-rectangular triangle.

**Obtuse Hyperbola.** One where the asymptotes make an angle toward the curve greater than 90°.

**O'Callaghan,** EDMUND BAILEY, 1797–1880. Editor of N. Y. State Records. *Hist. New Netherlands*, 1846; *Documentary Hist. N. Y.*, 4 vols., 1849–51.

**Ocana.** Town of the republic of Colombia, 235 m. n.n.w. of Bogota, founded in 1572. It is healthily and picturesquely situated, at an altitude of 3,820 ft. It is in a fine agricultural district, and is a center of trade. It has a valuable copper mine. Pop. 8,000.

**Occam,** or **Ockham,** WILLIAM OF, ab.1280–ab.1349. English schoolman, *Doctor invincibilis;* Franciscan, said to have become general of the order 1342; opponent of the temporal power of the popes, eminent logician, and chief of the Nominalists. His philosophy attacked scholastic realism, and laid the foundation of theological skepticism.

**Occasional Causes,** DOCTRINE OF. Cartesian doctrine, used to explain the action of matter and mind upon each other.

**Occiput.** Back or top of the head in insects.

**Occleve,** or **Hoccleve,** THOMAS, ab.1370–1454. English poet.

**Occlusion.** Property which some metals possess of absorbing gases. Platinum at a red heat will occlude four times its volume of hydrogen. Palladium in the form of foil, at 100° C., occludes 643 times its volume of hydrogen. By heating the metal to redness in a vacuum, the gas may be driven out and measured. See ABSORBING POWER.

**Occom,** SAMSON, ab.1723–1792. Indian preacher sent to England 1766 to raise funds for E. Wheelock's school, out of which grew Dartmouth Coll.

**Occultation.** Eclipse of a star by the moon or a planet.

**Occultism.** See ALCHEMY, ASTROLOGY, MAGIC, and THEOSOPHY.

**Occupancy.** Species of title acquired by taking possession of property belonging to no one: of small importance in modern law.

**Occupation.** In International Law, means of peacefully acquiring territory previously unoccupied by any but a savage nation, or of acquiring it by conquest. Military occupation of an enemy's territory must be actual to confer rights. In private law, one's trade or calling.

**Occupation-Diseases.** Resulting from the occupation of the patient. They may be caused by mechanical irritation, as inhaled dust produced in manufacturing processes, as with needle-making and pottery; by absorbing poisons, as lead-poisoning with painters, or phosphorus-poisoning in match-making; or by the over use of any organ, as in writer's cramp.

**Ocean.** See SEA.

**Oceania.** Central parts of the Pacific lying e. of Japan, the Philippines, the Moluccas, and Australia across to the American coast. In a wider sense, but little used, it includes Australia and New Zealand and even the Antarctic lands.

**Oceanides.** See NYMPHS.

**Oceanography.** Description of the ocean and its phenomena.

**Oceanology.** Study of the causes of the phenomena of the ocean.

**Oceanus.** God of the water which surrounds the earth; father of the river-gods and water-nymphs; conceived as a river in which the sun and stars rise and set, and on whose banks are the abodes of the dead.

**Ocellata.** See TUBULARIÆ.

**Ocelli.** Simple eyes of Invertebrates. They are sometimes numerous, consist of nervous cells imbedded in pigment, and have often a refracting body in front of them. Compound eyes are often also present.

**Ocelot.** *Felis pardalis.* American forest cat; length ab. 30 in., wt. 25 lbs.; of tawny yellow to reddish gray color, with

Ocelot.

eye like black spots and stripes. It ranges from Texas to Patagonia.

**Ocher,** or OCHRE. 1. Earthy variety of anhydrous ferric oxide, red in color. 2. Earthy variety of hydrous ferric oxide, containing ab. 20 per cent of water. 3. Commercially, clayey earths, colored by iron in some form and varying in color from yellow to orange, brown, or red, that when ground with oil are used as pigments. Ochers are usually products of the decomposition of iron ores, and vary much in quality in different localties. 4. Mineralogically, earthy accumulations of oxides of metals other than iron, *e.g.*, bismuth, molybdic, tungstic.

**Ochino,** BERNARDINO, 1487–1565. Italian reformer, general of the Capuchins 1538. Threatened by the Inquisition, he escaped, and thenceforth led a wandering life, chiefly in England and at Zurich, being expelled from several cities. Some of his sermons and *Dialogues* were tr. His later views were supposed to be Socinian.

**Ochnaceæ.** Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Dicotyledons*, comprising 12 genera and ab. 160 species, mostly shrubs and trees, distributed throughout the tropics of the whole earth.

**Ochoa y Ronna,** EUGENIO DE, 1815–1872. Spanish author and translator.

**Ochreate.** Stipules which sheath the stem of the plant on which they occur for a greater or less distance below the leaves, as in Knotweeds.

**Ockley,** SIMON, 1678–1720. Arabic prof. Cambridge 1711. *Hist. Saracens*, 1708–18.

**Ocmulgee.** River of central Ga., branch of the Altamaha. Length ab. 300 m.

**O'Connell,** DANIEL, 1775–1847. Irish leader: M.P. from 1829; imprisoned May 30–Sept. 4, 1844. His agitation for repeal relied on moral force: his influence was vast until ab. 1845, when the Young Ireland party broke bounds. *Speeches and Letters*, 1875.

**O'Connor,** FEARGUS EDWARD, 1796–1855. Irish Chartist, M.P. 1832.

**O'Connor,** RODERICK, 1116–1198. King of Connaught 1156–86; "King of Ireland" 1166; allied with the English 1175.

**O'Connor,** THOMAS POWER, b. 1848. Irish journalist and author, M.P. 1880; pres. National League 1883; Parnellite leader.

**O'Connor,** WILLIAM DOUGLAS, 1833–1892. American writer on Walt Whitman and the Bacon-Shakespeare theory. *Harrington*, 1860.

**O'Conor,** CHARLES, 1804–1884. Long leader of the New York bar. He sympathized with the South in the Civil War, and was counsel for Jefferson Davis when indicted for treason 1865.

**Octactinia.** See ALCYONARIA.

**Octagon.** Polygon of eight sides.

**Octahedrite.** $TiO_2$. Rare mineral of the same composition as rutile, but crystallizing in the tetragonal system.

**Octahedron.** Polyhedron of eight faces.

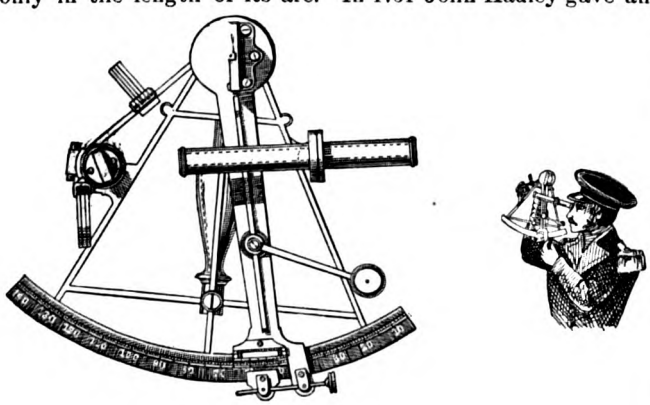
**Octamerous.** Flowers constructed on the plan of eight members of each circle of parts.

**Octandria.** Linnæan class of plants, comprising all those with eight stamens, as Evening Primrose, Fuchsia, and the Heaths.

**Octandrous.** Flower with eight stamens.

**Octane.** $C_8H_{18}$. Liquid hydrocarbon, boiling at 124° C.; known in several forms; present in large quantity in petroleum naphtha, and prepared from it by distillation.

**Octant.** Instrument differing from a quadrant or sextant only in the length of its arc. In 1731 John Hadley gave an



Sextant.

account of an octant employing double reflection like the sextant.

**Octastyle.** Building or portico with eight columns in front.

**Octavia,** 65–11 B.C. Sister of Augustus; wife of C. Marcellus, and of Antony, who divorced her 32 B.C.—Her son, MARCELLUS, d. 23 B.C., was to succeed his uncle.

**Octavianus,** or OCTAVIUS. See AUGUSTUS.

**October.** Tenth month of the year. It was the eighth month of the Roman year, and sacred to Mars. Called the wine month by the Anglo-Saxons.

**Octocarpellary.** Ovary consisting of eight carpels.

**Octogynous.** Flower with eight pistils.

**Octomeralia.** See DISCOPHORA.

**Octopetalous.** Corolla consisting of eight petals.

**Octophyllous.** Calyx or corolla composed of eight leaves (sepals and petals).

**Octopoda.** See DIBRANCHIATA.

**Octopus.** See DIBRANCHIATA.

**Octostichous.** Eight-ranked, as the arrangement of the alternate leaves of the Holly.

**Octroi.** Tax on all edibles brought into French towns; in abeyance 1791–98.

**Octyl Alcohol.** $C_8H_{17}.OH$. Found combined with acetic acid in varieties of the *Heracleum*; syrup boiling at 192° C. On oxidation it furnishes caprylic acid.

**Ocular Plates.** Pieces of the echinoderm shell, at the extremities of the ambulacral zones, and bearing the eyes.

**Oculist.** Physician devoting his attention to the care of the defects and diseases of the eye; an ophthalmologist. The word is sometimes employed to designate a vender of spectacles, usually an itinerant.

**Od.** Force imagined by Reichenbach to pervade all nature; visible in a flame or iridescence at the poles of magnets and crystals; supposed to be the cause of mesmerism and hypnotism; called odic force and psychic force.

**Odd Fellows.** Order started in London ab. 1745; brought to the U. S. 1806, but without permanent footing till 1819, when a lodge was organized in Baltimore. The Grand Lodge of the U. S. first met Feb. 1825. A ladies' degree was adopted 1851, which in 1893 comprised a membership of 108,732. A military degree, that of Patriarch Militant, was added 1882. The supreme body is styled the Sovereign Grand Lodge. In 1895 there were 788,968 members in the U. S. and Canada. There is also a colored branch numbering 150,000. The English branch numbers 856,980. There are also grand lodges in Germany, Denmark, and Switzerland, and subordinate lodges in many other countries.

**Oddly Odd Number.** One which divided by four leaves three as a remainder. The alternate odd numbers are oddly odd.

**Odd Number.** Opposed to even; one which cannot be exactly divided by two.

**Odd or Even.** Game played with marbles, beans, or other small articles. One player holds a number in his closed hand, and his opponent guesses whether it is odd or even.

**Ode.** Most ambitious variety of lyric poetry; irregular in metrical structure; cultivated by many Greeks, a few Romans, and in modern times by Spenser, Milton, Dryden, and other English writers. Among the noblest recent examples are Wordsworth's *Ode to Duty* and Lowell's *Harvard Commemoration Ode*.

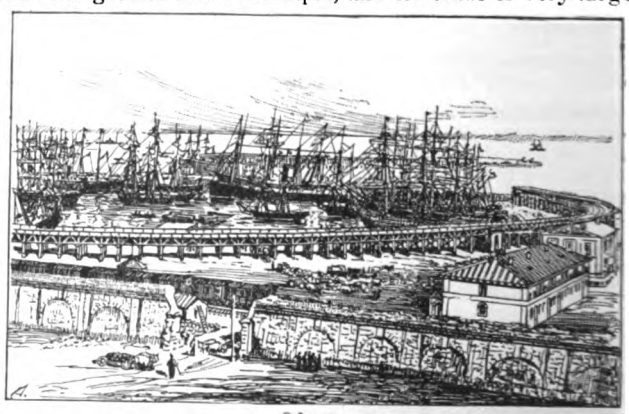
**Odenathus,** d. ab. 267. Prince of Palmyra. He checked the victorious career of the Persians under Sapor after the defeat of Valerian 260; received from the senate the title of Augustus; was associated in the empire by Gallienus, and was succeeded by ZENOBIA (q.v.), his widow.

**Odenwald.** Highland region of Germany, in the s. part of Hesse-Darmstadt.

**Oder.** River of Germany, heading in Moravia and flowing n.w. and n. to the Baltic. Length 550 m.

**Odescalchi.** See INNOCENT XI.

**Odessa.** Seaport of Russia, on the Black Sea; founded 1794. Its growth has been rapid, and its trade is very large,



Odessa.

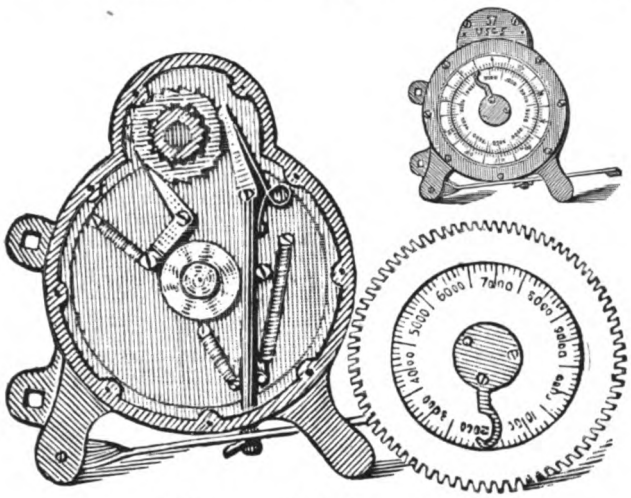
especially in the exportation of grain. Its university, dating from 1865, has ab. 600 students. Pop., 1892, 332,690.

**Odic Force.** See OD.

**Odin,** or WODEN. In Norse Mythology, god of the light, the sky, and the moving air; the All-father.

**Odoãcer,** d. 493. German chief, leader of the barbarians who overturned the Western empire and dethroned Romulus Augustulus A.D. 476. He reigned as king of Italy till overthrown by Theodoric, King of the Goths, 493.

**Odometer.** Instrument for counting the number of revolutions of a carriage wheel and thereby determining the distance between two places. Vitruvius says that it was discovered by



Odometer, or Spoke Cyclometer.

the ancients. When attached to a chariot, the wheels were so made that at each revolution it would advance 12½ ft., or a Roman mile in 400 revolutions.

**Odonata.** See LIBELLULIDÆ.

**O'Donnell,** LEOPOLD, 1809–1867. Spanish soldier of Irish descent; Lieut.-gen. 1839; Gov. of Cuba 1843–48; Marshal; Minister of War 1854; Prime Minister 1856, 1858, and later till 1866; commander in Morocco 1859; Duke of Tetuan 1860.

**O'Donoju,** JUAN, d. 1821. Last Viceroy of Mexico (1821), whose independence he recognized.

**O'Donovan,** WILLIAM RUDOLF, b. 1844. American sculptor.

**Odontoceti** (DENTICETE). Sub-order of *Cetacea*, including toothed whales, that feed on fish. The teeth are alike, one set, and numerous. Dolphins (*Delphinidæ*), Narwhals (*Monodontidæ*), Sperm-whales (*Catodontidæ*), and Xiphoid-whales (*Hyperodontidæ* or *Rhynchoceti*), are examples of the families included. The last live in the N. Atlantic, and have beak-like snouts with only one or two teeth on each side in the lower jaw. The blow-hole is crescent-shaped.

**Odontoglossa.** See LAMELLIROSTRES.

**Odontograph.** Instrument to aid in describing the profiles of the teeth of gear-wheels with a degree of approximation which shall be admissible, and take much less time and skill than their exact drawing would require. Willis's is the most widely known and enables arcs of circles to replace the epi- and hypo-cycloid curves, the radius of the circular arc being equal to the radius of the osculatory circle to the true curve near the pitch point. Robinson's instrument replaces the exact curve by a part of a spiral which approximates to the required curve: Grant's is the most recently proposed. Most of these approximations give teeth broader and stronger at the root and thinner at the tip than the exact profiles.

**Odontolcæ.** Order of *Odontornithes*, including the Cretaceous fossil bird HESPERORNIS (q.v.).

**Odontolite.** Bone-turquoise; mineral substance, resembling true turquoise, but of organic origin. The color is ascribed to the action of an iron phosphate.

**Odontophora.** See CEPHALOPHORA.

**Odontophore.** See RADULA.

**Odontormæ.** Order of *Odontornithes*, including the fossil birds *Apatornis* and *Ichthyornis*.

**Odontornithes.** Sub-class of *Aves*, including fossil forms having teeth. There are two orders, *Odontolcæ* and *Odontormæ*.

**Odovara.** Town of Japan on the e. coast of the island of Hondo, 40 m. s.w. of Tokio. It has a considerable coasting

View of Odovara.

trade as the outlet for the produce of the fertile district of Fuzi-san. Pop. 20,000.

**O'Dwyer's Tubes.** Curved tubes of metal designed to be inserted in the wind-pipe through the mouth as a substitute for the operation of tracheotomy. They are used in cases of membranous croup and diphtheria to relieve threatened suffocation. Invented by Joseph O'Dwyer, a New York physician.

**Odyniec,** ANTONI EDWARD, ab. 1805–1885. Polish poet, dramatist, journalist, and translator. *Letters of Travel*, 1875–78.

**Odysseus.** See ULYSSES.

**Odyssey.** Greek epic poem ascribed to Homer. Its subject is the wanderings of Ulysses after the fall of Troy. It is contrasted with the *Iliad* as being domestic and not military in its main theme. Its plot, like that of the *Iliad*, has been criticised for want of unity.

**Œcolampadius** (HEUSSGEN), JOHANNES, 1482–1531. German reformer, prof. Basel 1531; called the Swiss Melanchthon. He disputed with R. C. theologians 1526–28, and with Luther 1529: his views were Zwinglian.

**Œcology.** See ZOÖLOGY.

**Œcumenical Council.** See COUNCIL GENERAL.

**Œdema.** Localized, painless, non-inflammatory swelling of any part of the body when caused by an infiltration of serum into the areolar tissue. It is a variety of dropsy, and is frequently a symptom of disease of the heart or kidneys. It is sometimes located in the glottis, and may rapidly cause death by closing the wind-pipe, preventing respiration.

**Oeder,** GEORG CHRISTIAN, 1728–1791. German botanist. *Icones plantarum Daniæ et Norvegiæ*, 1761–1871; *Elementa botanica*, 1764–66.

**Œdipus.** Hero of Greek tragedies; son of Laius, King of Thebes: exposed and reared by a shepherd. He slew his father in a scuffle, not recognizing him; solved the riddle of the Sphinx; was made King of Thebes, and married Iocaste, his mother. A plague was sent on the city, and his crimes were revealed, whereon he blinded himself and went into exile.

**Œdogoniaceæ.** Small order of minute filamentous confervoid green *Algæ*, living in fresh water, increasing by both sexual and asexual processes.

**Œhlenschläger,** ADAM GOTTLOB, 1779–1850. Danish dramatic, epic, and lyric poet of high rank; prof. Copenhagen 1810. His best work is in tragedies, mostly of national character. *Hakon Jarl*, 1807, tr. 1875; *Baldur*, 1807; *Corregio*, 1811, tr. 1854; *Nordens Guder*, 1819.

**Oehler,** GUSTAV FRIEDRICH, D.D., 1812–1872. Prof. Breslau 1845, Tubingen 1852. *Theology of O. T.*, 1873–74, tr. 1874–75; *Symbolik*, 1876.

**Œnanthic Ether.** Liquid consisting of a mixture of the amyl and ethyl salts of caprinic, caprylic, and butyric acids, with traces of the free acids; made by distilling wine lees with steam; used to give a wine odor to artificial wine and liquors.

**Œnanthol.** $C_7H_{14}O$. Heptyl aldehyde; liquid boiling at 155° C., prepared by distilling castor oil.

**Œnopides,** 5th cent. B.C. Greek sage, who attained much astronomical lore in Egypt.

**Oersted,** HANS CHRISTIAN, 1777–1851. Prof. Copenhagen 1806; founder of electro-magnetism 1819. *Mechanical Physics*, 1845; *Soul in Nature*, 1850.—His brother, ANDERS SANDOE, 1778–1860, wrote much on Danish jurisprudence, and was Premier 1853. *Life and Times*, 4 vols., 1851–57.

**Oertel,** MAX JOSEPH, b. 1835. Prof. Munich 1876; medical writer.

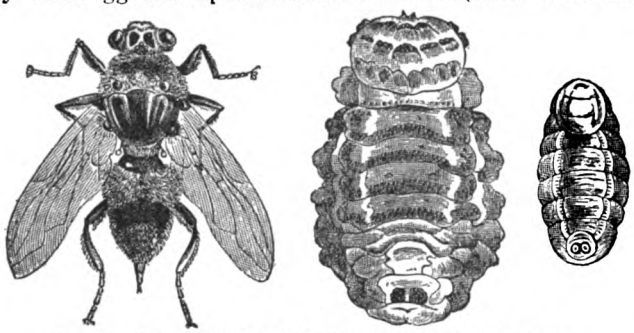
**Oesar.** See GLACIER and ESKER.

**Oesel.** Russian island in the Baltic, near the Gulf of Riga. Area ab. 1,000 sq. m.; pop., 1891, 53,120.

**Oeser,** ADAM FRIEDRICH, 1707–1799. German painter, art critic and teacher, who exerted great influence on Winckelmann and Goethe.

**Œsophagus.** See DIGESTION, GULLET, and LARYNX.

**Œstridæ** (GAD-FLIES). Family of *Muscaria*, characterized by having an aborted proboscis. The female has an ovipositor, by which eggs are deposited on or in the skin (often in the nostrils) of domestic animals, and in S. America even of man. The eggs are licked off, and thus the larvæ get to the internal organs; or they may live beneath the skin, producing bots. Some of these maggots devour living flesh after the manner of maggots in putrid flesh.



Gad-Fly of Ox (*Hypodermis bovis*): *a*, Fly, *b*, Larva, *c*, Pupa.

**Oetingeo,** FRIEDRICH CHRISTOPH, 1702–1782. German mystical theologian. *Autobiography*, 1845; *Works*, 11 vols., 1858–63.

**Ofanto.** River in Italy forming the boundary between Campania and Apulia on the n. and Basilicata on the s. Length 103 m.

**Offa,** d. 796. King of Mercia from 758; builder of a dyke from Dee to Severn and Wye, along the Welsh border.

**Offenbach,** JACQUES, 1819–1880. German musician of Jewish race, creator of the French *opéra bouffe*; son of JUDA O. (whose real name was Eberscht), cantor of a synagogue in Cologne. Jacques was educated musically in Paris and spent his life there, playing 'cello at first at the Opéra Comique, becoming conductor at the Théâtre Français 1847, and then manager of his own *Bouffes-Parisiens*, at which many of his operettas were brought forward. He came to the U. S. 1876. *Notes d'un musicien en voyage*, 1877. His works, of all kinds, number 102.

**Offense.** Punishable violation of law, including municipal ordinances.—In Ethics, violation of the moral law, or of duty toward individuals.

**Offensive Operations.** In the conduct of a war, the movements of an army are said to be offensive when the initiative is always taken against the enemy's forces.

**Offertorium.** In R. C. service, piece of music performed immediately after the *Credo* in the Mass, while the priest is making the offering. The ancient church made use of a special psalm for this on each day of the year save Good Friday and Holy Saturday, but now its character is generally left to the choirmaster's taste or discretion.

**Offertory.** The part of the eucharistic service which accompanies the reception of the alms. The sentences date from ab. 400.

**Office.** Part of the Prayer Book used for a special purpose, as matrimony, visitation of the sick, burial, consecration, or institution.

**Office.** Employment in another's affair. It may be private, public, or quasi public; it is public when the employment is on behalf of the government, and embraces the ideas of tenure, duration, emolument, and duties.

**Officer.** In a military sense, a person who receives a commission from the Executive, and which is confirmed by the Senate, and under which his status in the army is clearly defined. A field officer is either a Major, Lieutenant-colonel or Colonel, and the proper command is a battalion for the Major or Lieutenant-colonel, and a regiment for a Colonel. A general officer is a Brigadier, Major-general, Lieutenant-general or General; the command proper of a Brigadier is a brigade; of a Major-general, a division of two or more brigades; of a Lieutenant-general, an army corps, and of a General an army.

**Officer of the Day.** Detailed for the day, to attend to the interior economy of the corps or garrison to which he belongs; he has charge of the guard, prisoners, police of the garrison, etc., and reports to the commanding officer for orders during his tour of duty.

**Officer of the Guard.** Detailed daily for duty with the guard at a military post. His duties comprise a supervision of the guard, inspection of the reliefs and sentinels, and to see that they are acquainted with their duties and are alert and well disciplined.

**Officers,** STAFF. Officers distinguished from regimental officers. They belong to the Quartermaster, Commissary, Medical, Adjutant-general's Departments, etc. The adjutant and quartermaster of a regiment are detailed for regimental staff duty for four years in the U.S. Army. The personal staff of a general comprises the aides-de-camp and other officers detailed to assist him.

**Officers,** SUBALTERN. Military officers whose rank is below that of a Captain.

**Official.** The channel through which all military communications pass from their source to their destination is called the official channel. It gives the stamp of regularity to all orders, reports, applications and other official papers.

**Officinal Plants.** Such as are recognized by the PHARMACOPEIA (q.v.) as the source of crude drugs or medical preparations prepared from the Vegetable Kingdom.

**Offset.** Short lateral branch from the base of a plant, bearing a new plant at its extremity.

**Offset.** Short line measured at right angles to the main line of a survey, to locate the position of a point.

**Ofterdingen,** HEINRICH VON, ab. 1400. German minnesinger.

**Ogam** (or OGHAM) **Alphabet.** Based on the Roman letters; used in cutting inscriptions upon ancient tombstones in Ireland. It dates from the 5th cent.

The Newton Stone, Aberdeenshire, Scotland.

The Ogam inscription, as distinguished from that in alphabetic characters, is thus read by the Earl of Southesk: (A)IDDAI QNEAN FORRERI IBH UA IOSIE, and interpreted as "Ada, daughter of Forar, of the race of the sons of Huas."

**Ogarev,** NIKOLAI, 1818–1877. Russian poet, in England from 1848.

**Ogden.** Capital of Weber co., Utah, on the Weber and O. rivers. It is the junction of Union Pacific, Central Pacific, Utah Central and Utah Northern railroads. Elevation 4,340 ft.; 1,029 m. from Omaha, and 878 m. from San Francisco. Pop., 1890, 14,889.

**Ogdensburg.** City of St. Lawrence co., N. Y., on the St. Lawrence, at the mouth of the Oswegatchie. It has a large lake trade. Pop., 1890, 11,662.

**Ogé,** JACQUES VINCENT, 1750–1791. Haytian insurrectionist.

**Ogee.** Line produced by the union of a convex and a concave curve. It is applied to moldings of such a profile in Gothic architecture, the curve being in each case more pronounced than in the cyma of classic architecture. Ogee moldings are especially frequent in late Gothic.

**Ogive.** French term denoting the pointed arch. The Gothic style is sometimes called accordingly the Ogival, corresponding to the Pointed in English.

**Oglesby,** RICHARD JAMES, b. 1824. Major-gen. U. S. Vols. 1862–64; Gov. of Ill. 1865–69 and 1885–89; U. S. Senator 1873–79.

**Oglethorpe,** JAMES EDWARD, 1698–1785. M.P. 1722; founder of Ga. 1733, and its Gov. till 1743; Major-gen. 1745.

**Ogowe.** River of w. Africa, explored 1876–78 by De Brazza. It rises ab. 2° 40′ S. lat., 14° 30′ E. long., and flows n.w. and s.w. to the Atlantic, through a region held by France.

**Ogyges.** Legendary king of Bœotia, which was inundated in his reign.

**O'Hara,** THEODORE, 1820–1867. Captain in the Mexican

War 1846–47; Colonel C.S.A. 1861–65; author of a well-known lyric, *The Bivouac of the Dead*, 1847.

**O'Higgins,** AMBROSIO, ab.1720–1801. Irish adventurer, who rose in the Chilian army, became Viceroy 1789, Marquis of Osorno 1792, and Viceroy of Peru 1795.—His son, BERNARDO, 1780–1846, was commander-in-chief 1813, and Pres. or Director of Chili 1817–23.

**Ohio.** One of the n. central States. Its area is 41,060 sq. m. The land is highest along a line trending n.e. and s.w. in the n. part, giving to the streams flowing s. to the O. longer courses than those on the n. The branches of the O. have eroded valleys of considerable depth in their lower courses, and the O., which forms the s. and part of the e. boundary, has for the most part bluff banks 300 to 400 ft. in height. The rivers of the State are the O., navigable throughout, the Muskingum, Scioto, and Miami, which are navigable for considerable distances. Lake Erie on the n. affords good facilities for commerce. The geological structure of the State is simple. The e. half is overlaid by Carboniferous formations, except a narrow strip of Devonian, surrounding Lake Erie and extending down the middle of the State. The s.w. part is made up of the Silurian formation. O. is primarily an agricultural State, but manufactures have assumed great importance. The value of farms, farming implements, and machinery in 1890 was $1,079,507,174, and of live stock $116,181,690. The chief mineral product is coal. Mileage of railroads, 1894, 8,643. O. was visited 1670 by La Salle, who took possession of the whole Northwest territory for France. In 1749 the English, whose settlements had been made under the Va. charter, giving indefinite w. boundaries, were warned to retire. This gave rise to a conflict which was finally settled only by the peace of Paris in 1763. During the Revolution controversies arose as to the rightful ownership of these unoccupied lands, some of the States appealing to their original charters, others maintaining that they ought to be surrendered for the common good. The controversy was settled in some cases by surrender, in others by compromise. Congress assumed jurisdiction over the Northwest territory 1787; one of the last acts of the old colonial congress was to provide a government for it. O. was admitted to the Union in 1802 as the 17th State. In the War of 1812 it was the scene of some of the most important events, especially Perry's naval victory on Lake Erie. Capital, Columbus; principal cities, Cincinnati and Cleveland. Production of coal, 1895, 13,376,137 tons. Pop., 1890, 3,672,316. (See Map, page 1088.)

**Ohio River.** Main eastern branch of the Mississippi, draining the west slopes of the Appalachian Mountains. It is formed by the junction of the Allegany and Monongahela, at Pittsburg, Pa. Thence its course is generally s.w. to its mouth at Cairo, Ill. Its main branches are, from the north, Muskingum, Scioto, Miami, and Wabash; from the south, the Kanawha, Big Sandy, Licking, Kentucky, Green, Cumberland, and Tennessee. Its length is 1,204 m.; average discharge 158,000 cubic ft. per second. It is navigable at ordinary stages of water to Pittsburg. There are falls at Louisville, which are surmounted by means of a canal and locks. Its drainage area is 201,720 sq. m. The great floods generally occur in May.

**Ohio State University.** At Columbus; a land-grant college, with schools of arts, science, agriculture, civil, electrial, mining, and mechanical engineering, pharmacy, veterinary medicine, and law, with a secondary department. It has 54 professors, 29 assistants, 11 graduate students, 561 in 4-year courses, 124 in 3-year courses, 87 in law; total 890. The State library of 65,000 vols. is available for consultation, as also the State law library of 15,000 vols.

**Ohio University.** At Athens, O.; chartered 1804, organized 1822. It has 19 instructors and ab. 300 students.

**Ohio Wesleyan University.** At Delaware, O.; opened 1841. Besides the college proper and preparatory school, there are musical, art, commercial, and graduate departments. It has 18 professors, 39 assistants, 51 graduate students, and 402 collegiate; total, with preparatory department and Female college, 1,271.

**Ohm.** Unit of electrical resistance; equal to $10^9$ C.G.S. electromagnetic units. The megohm is one million ohms: the microhm is one millionth of an ohm. The standard ohm, constructed by the Electrical Standards Committee of the British Association, and intended to be $10^9$ C.G.S. electromagnetic units of resistance, was found by Lord Rayleigh to be 1.3 per cent too small. The International Electrical Congress at its final session in Paris 1884 defined the ohm to be equal to the resistance of a column of mercury 1 square millimeter in cross section and 106 centimeters long. This ohm is known as the Congress or the Legal ohm. The average of later experiments of Prof. Rowland show the length of this mercury column to be probably 106.24 centimeters; so that the Congress ohm is too small by the difference. The relative values of the various ohms may be tabulated as follows:

| | | | |
|---|---|---|---|
| 1 theoretical ohm | $=10^9$ C.G.S.E.M. units | =106.24 cm., | mer. col. |
| 1 | B.A. unit=.9889 Congress ohms | =104.93 cm., | " " |
| 1 | Siemen's unit=.9540 B.A. units | =100 cm., | " " |

**Ohm,** GEORG SIMON, 1781–1854. Prof. of Mathematics in the Jesuits' College at Cologne in 1817, and in the Polytechnic School of Nuremberg 1833; Prof. of Experimental Physics at Munich 1849. His *Galvanische Kette mathematisch bearbeitet*, 1827, has had a most important influence on the whole development of electrodynamics. The valuable matter is summarized in Ohm's Law, which is as well established and as well understood as anything in physical science.

**Ohmmeter.** Instrument for indicating the resistance of an electric circuit. One form of it, devised by Ayrton and Perry, is a direct reading instrument: the indications are given by the position of an index needle on an empirically graduated arc.

**Ohm's Law.** The current strength in any circuit is equal to the ratio of the sum of the electromotive forces to the sum of the resistances in that circuit. This law was enunciated by Ohm 1829. If, *e.g.*, a dynamo of electromotive force E and resistance R be placed in circuit with a motor of electromotive force—e and resistance r, the resistance of the leads being $\rho$, Ohm's law teaches that the current strength in that circuit, or C, equals $\frac{E-e}{R+r+\rho}$.

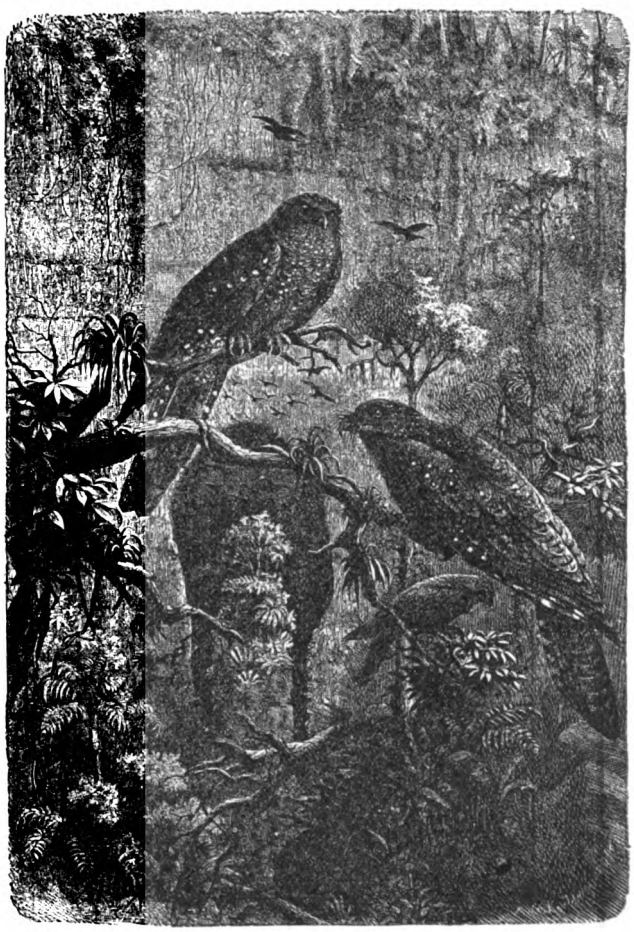
**Ohnet,** GEORGES, b. 1848. French novelist. *Serge Panine*, 1881; *Volonté*, 1888.

**Oidium.** Genus of *Fungi* known as vine-mildew.

**Oigopsidæ.** See DECAPODA and DIBRANCHIATA.

**Oil.** See LUBRICANT.

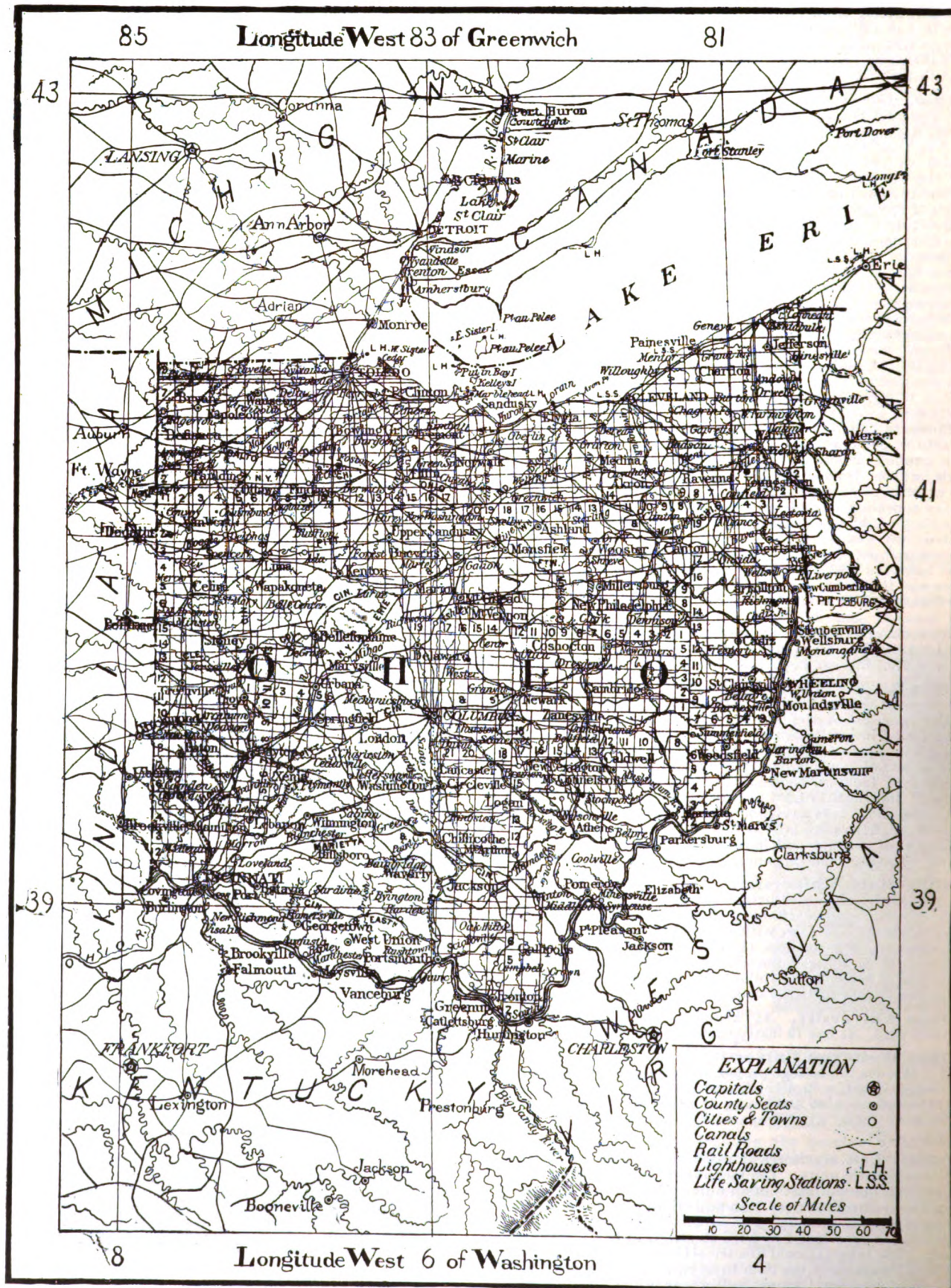
**Oil Bird** (STEATORIUS). Bird of family *Caprimulgidæ*, but with fruit-eating habits. It builds cheese-shaped nests in caves



Oil Bird.

on the island of Trinidad and adjacent parts of S. America. The natives press an oil from the young birds for use in place of butter.

**Oil-Cake.** Made from linseed, cotton-seed, etc., after the


85
Longitude West 83 of Greenwich
81
43
41
39
8
Longitude West 6 of Washington
4
MICHIGAN
CANADA
LAKE ERIE
INDIANA
PENNSYLVANIA
OHIO
KENTUCKY
WEST VIRGINIA
LANSING
Ann Arbor
DETROIT
Port Huron
St Thomas
Port Dover
Port Stanley
Erie
Adrian
Monroe
Toledo
Sandusky
CLEVELAND
Akron
Canton
Youngstown
Ashland
Mansfield
Wooster
Medina
Ravenna
Fremont
Norwalk
Lima
Kenton
Marion
Mt Gilead
Mt Vernon
Coshocton
Newark
COLUMBUS
Springfield
Dayton
Zanesville
Cambridge
Caldwell
Cleveland
Lancaster
Chillicothe
Portsmouth
Jackson
Athens
Parkersburg
Clarksburg
Wheeling
Mounds ville
Steubenville
Wellsburg
Cadiz
Pittsburg
New Martinsville
St Marys
Elizabeth
Pomeroy
Gallipolis
Point Pleasant
Sutton
Cincinnati
Covington
Newport
Hamilton
Middletown
Springfield
Xenia
Chillicothe
Lexington
Frankfort
Morehead
Prestonburg
Jackson
Booneville
Vanceburg
Maysville
Ashland
Huntington
Charleston
EXPLANATION
Capitals
County Seats
Cities & Towns
Canals
Rail Roads
Lighthouses L.H.
Life Saving Stations L.S.S.
Scale of Miles
10 20 30 40 50 60 70

extraction of most of their oil; used for feeding cattle and sheep, and as a fertilizer. See LINSEED MEAL.

**Oil City.** In Venanago co., Pa., on the Allegany; center of the petroleum region; chartered 1862. Pop., 1890, 10,932.

**Oil Cloth.** Heavy, painted fabric for covering floors. It is manufactured with a burlap foundation, upon which successive coatings of paint are applied. The colored patterns are printed with wooden blocks. See LINOLEUM.

**Oil Cup.** See LUBRICATOR.

**Oil Nut.** See BUFFALO NUT.

**Oil of Tar.** See TAR.

**Oil of Turpentine.** See TURPENTINE.

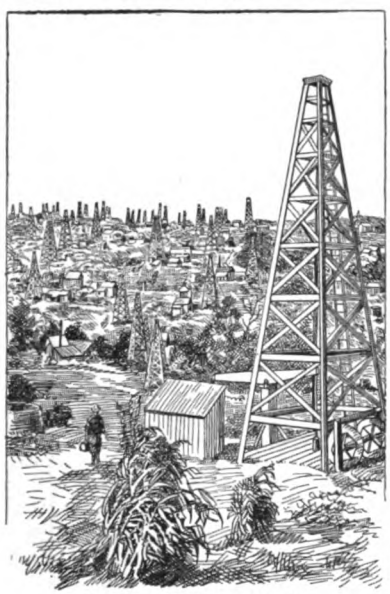
**Oil of Vitriol.** See SULPHURIC ACID.

**Oil Rivers.** Branches of the Niger, with other streams, forming its large delta.

**Oils.** A general term applied to liquids insoluble or difficultly soluble in water; the neutral liquids obtained from animal and plant tissues. Fixed oils undergo decomposition when distilled alone or with steam. Volatile or essential oils distill without decomposition. The common fixed oils are the glyceryl salts of palmitic, stearic, and oleic acids. Drying oils slowly absorb oxygen from the air and become converted into varnishes; *e.g.*, linseed and hemp. They consist generally of the glyceryl salts of linoleic and other unsaturated acids of the same class. The essential oils are hydrocarbons, terpenes, ethereal salts, ketones, phenols, aldehydes, acids, or mixtures of these.

**Oilstone.** Fine-grained siliceous stone used for sharpening knives and other edged tools; whetstone.

**Oil Well.** Usually 5 to 8 in. in diameter, bored through the overlying strata to reach oil-bearing rock. The reports of the 2d Geological Survey of Pa. contain detailed records of several thousand wells. The producing wells in Pa. seldom exceed 2,000 ft. in depth or penetrate to more than 400 ft. below the sea-level. The Watson well, near Titusville, non-producing, was sunk to a depth of 3,553 ft. To prevent the influx of water from porous strata passed through in sinking, the wells generally have to be cased or lined with water-tight tubing. In some wells the oil rises naturally to the surface and overflows, at least for a time; in others resort is had to pumping. The life of a well, or the length of time it will yield oil in profitable quantity, varies with the extent and the geological character of the stratum from which the supply comes. See PETROLEUM.



Oil Wells in Pennsylvania.

**Oinomania.** See DIPSOMANIA.

**Ointments.** Combination of a remedy with a fatty substance of such consistence as to soften when applied to the body. Medicines are usually so applied for their local effect. Occasionally, as in the use of mercurial ointment, the aim is to introduce the remedy into the circulation for its constitutional effect.

**Ojeda,** ALONZO DE, 1465–1514. Companion of Columbus on his second voyage 1493; discoverer of Venezuela 1499.

**Ojibways.** Indians originally found w. of Lake Superior. See CHIPPEWAS.

**Oka.** Righthand branch of the Volga, in Russia. Length 837 m., drainage area 87,168 sq. m.

**Okeechobee.** Lake of s. Florida, n. of the Everglades. Area ab. 1,250 sq. m.

**Okefinokee.** Swamp in s. Ga. and n.e. Fla. Area ab. 800 sq. m.

**Okeghem** (OCKENHEIM, OKEKEM, OKENGHEM), JEAN DE, ab. 1430–1495. Chorister in the cathedral in Antwerp 1443, *premier chapellain* at the court of Charles VII. in Paris 1454, *Trésorier* of the Abbey St. Martin de Tours 1459, and Royal Chapelmaster 1465. He figures in musical history as the founder of the second Netherland School.

**Oken,** LORENZ, 1779–1851. Prof. Jena 1807–19, Munich 1828, and Zurich 1832. His *Physio-philosophie*, 1802, placed him at the head of German nature-philosophers. He completed the extension of Kant's theories to nature, begun by Fichte and Schelling. The central idea is, that the whole is in each of its parts; *e.g.*, the head is a repetition of the trunk. He anticipated the cell theory of Schwann, and the modern views on light, heat, and conservation of energy. The entire universe he looked on as an organism, represented in man as a microcosm, the lower animals being specific evolutions of the different organs in man. He advocated the idea of the skull being composed of vertebræ, 13 years before Goethe published the same theory. He established the periodical *Isis*, 1816, and founded itinerant scientific societies.

**Okhotsk,** SEA OF. Arm of the Pacific, extending into e. coast of Siberia.

**Oklahoma.** Territory formed from a portion of Indian Territory, with the Public Land Strip. The area is 39,030 sq. m. The surface is mainly an undulating prairie, growing arid in the w. portion. It was opened to settlement April 22, 1889; organized as a Territory May 2, 1890; enlarged 1891. The Cherokee Strip was added Sept. 1893. The rush of settlers on each occasion was terrific. Capital, Guthrie. Pop., 1890, 61,834; 1894, 219,779. (See Map, page 1090.)

**Okra.** *Abelmoschus esculentus.* Tall herb of the Mallow family, cultivated for its pods, which are used in soups, etc.

**Okubo,** TOSHIMICHI, d. 1878. Japanese Minister of State from 1870.

**Okuma,** SHIGENOBU, b. 1837. Japanese Minister of Finance 1870–82, and of Foreign Affairs 1889–91; head of the Kaishinto party from 1882.

**Olacinaceæ.** Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Dicotyledons*, comprising 61 genera and ab. 275 species, distributed through the tropical and warm regions of both hemispheres.

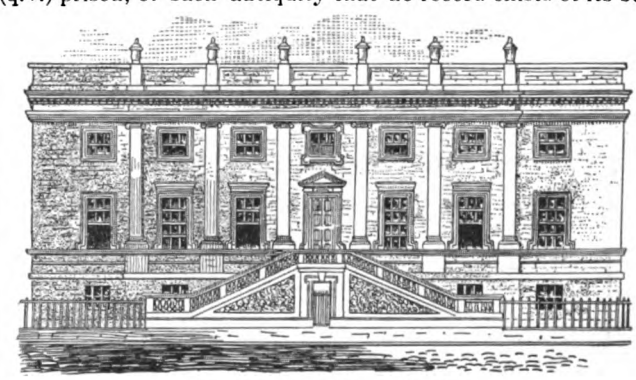
**Olaf,** ST., 995–1030. King of Norway 1015–28; twice defeated by Canute; patron saint of Norway, which he Christianized by violent means; locally canonized 1031, but not recognized by Rome. The order named from him was instituted 1847 by Oscar I.

**Olaf Trygvason,** 964–1000. Viking chief, hero of many legends; King of Norway 995; slain in a sea-fight with Swedes and Danes.

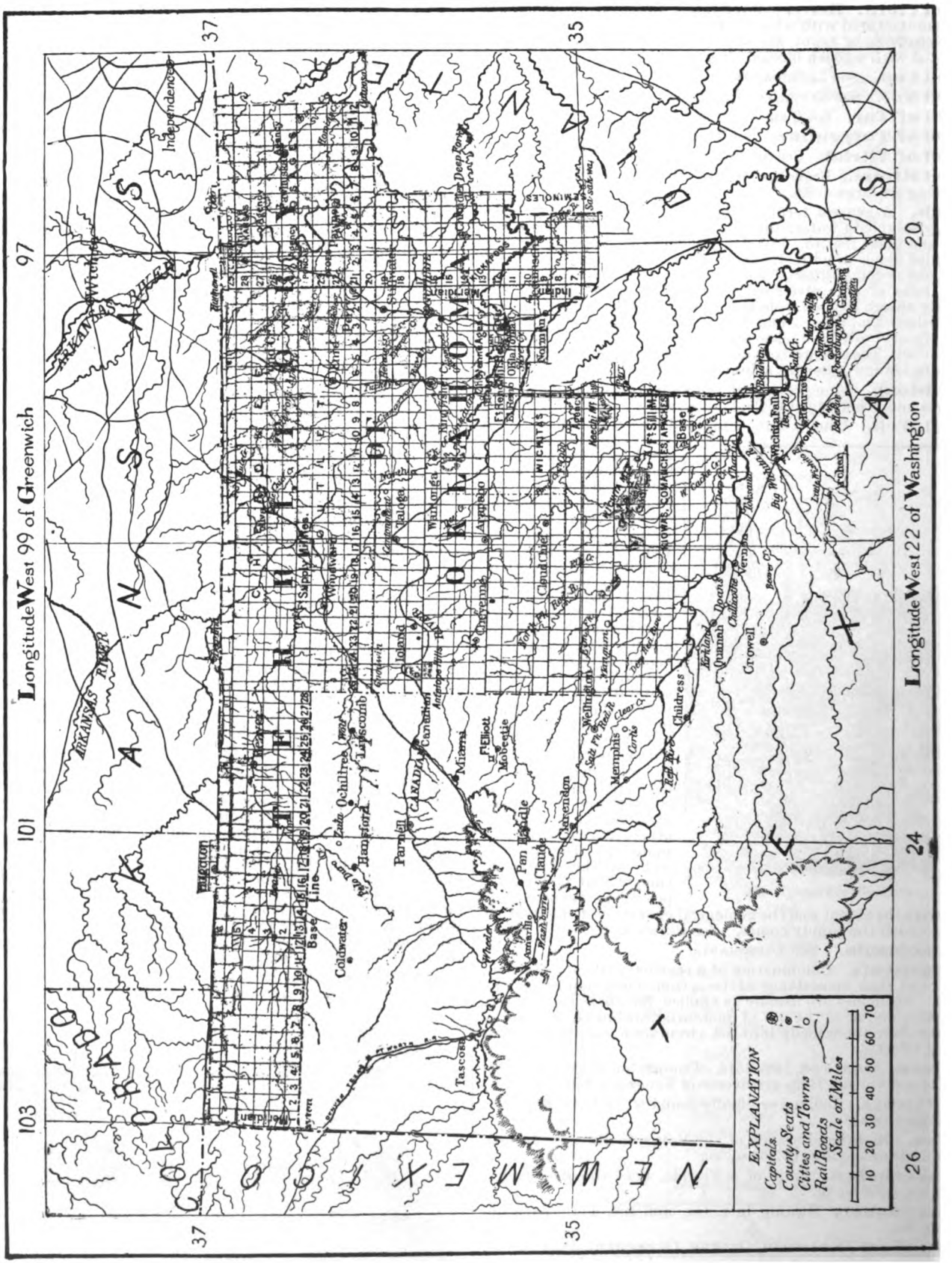
**Olbers,** HEINRICH WILHELM MATTHIAS, 1758–1840. German physician and astronomer, discoverer of Pallas 1802, and Vesta 1807; author of the well-known hypothesis respecting the origin of the asteroids; viz., that they are fragments of a large planet which was broken to pieces by an explosion. This hypothesis is not now regarded as tenable.

**Old Age,** DISEASES OF. Such as occur because of senile changes in the tissues, which are of the nature of decay. The bones become more brittle and their cartilaginous extremities ossify. The arteries are less elastic and have chalky deposits in their coats. The muscles diminish in size and undergo fatty degeneration; this weakening of muscle fiber is especially noticed in the heart. The secretions diminish and vital functions are sluggish. One would expect digestive disturbance, imperfect circulation (with cold extremities), imperfect action of the secretory organs (especially the kidneys) and faulty respiration. It is necessary to abstain from hurry and worry, give ample time to eat and more time to sleep. Avoid excitement and everything that will put a sudden strain on the heart, arteries or lungs.

**Old Bailey.** Courthouse in London adjoining NEWGATE (q.v.) prison, of such antiquity that no record exists of its beginnings. Criminals of all sorts, from traitors to thieves, were anciently tried here in vast numbers; *e.g.*, the judges of Charles



Surgeons' Hall, Old Bailey, 1800.


Longitude West 99 of Greenwich
Longitude West 22 of Washington
EXPLANATION
Capitals
County Seats
Cities and Towns
Rail Roads
Scale of Miles
10 20 30 40 50 60 70
Independence
Coldwater
Hardesty
Tascosa
Pan Handle
Memphis
Childress
Crowell
Guthrie
Kansas
Colorado
New Mexico
Texas

I. 1660, Lord William Russell 1683, Jack Sheppard and Jonathan Wild 1724–25.

**Old Believers.** Russian sect. See RASKOLNIK.

**Old Bullion.** Nickname of Senator Thomas H. Benton of Mo., indicating his financial conservatism.

**Oldcastle.** See COBHAM.

**Old Catholics.** Deniers of the authority of the Vatican Council and of the doctrinal infallibility of the Pope. They have a bishop, seminaries at Bonn and Berne, and some 50,000 members in Germany, Switzerland, Austria, and Holland.

**Old Dominion.** Va.; called in old documents "His Majesty's Dominion."

**Oldenbarneveldt.** See BARNEVELDT.

**Oldenburg.** Grandduchy of n. Germany since 1815. Area 2,508 sq. m. It was independent 1180–1667, was held by Denmark 1667–1773, and then became a duchy. Pop., 1890, 354,968.

**Old English.** See ENGLISH LANGUAGE and ENGLISH LITERATURE.

**Oldfield,** ANNE, 1683–1730. English actress, most eminent in comedy.

**Oldham.** Manufacturing borough on the Medlock, 6 m. n.e. of Manchester. Pop., 1890, 146,716.

**Oldham,** JOHN, 1653–1683. English poet.

**Oldham,** THOMAS, 1816–1878. Supt. Geological Survey of India.

**Old Man.** In vein mining, abandoned workings or spaces filled with broken rock.

**Oldmixon,** JOHN, 1673–1742. English writer of histories and school-books, pilloried by Pope in the *Dunciad*.

**Old Mortality.** See PATERSON, ROBERT.

**Old Point Comfort.** Virginia watering place at the mouth of James River. See FORTRESS MONROE.

**Old Probabilities.** Nickname applied 1871 to the then unknown author of the daily weather predictions and storm warnings of the Signal Service; subsequently assigned to General Myer as the official chief, until it became known that Prof. Abbe was the real author, when he began to be called the "genuine" or "original Old Prob." the sobriquet "Old Prob." attached to General Myer, and the title "Young Prob." to the young prediction officers of the signal office.

**Old Prussian.** See LETTISH.

**Old Red Sandstone.** A greater part of the Scottish Devonian consists of this material. It has a thickness of many thousand feet, and in it were found the fossil fishes described by Hugh Miller. The Lower beds are separated from the Upper by a marked unconformity.

**Old Sledge.** See ALL-FOURS.

**Old South Church.** In Boston; erected in 1730; notable for meetings of the Liberty party held in it; now a museum of historical relics.

**Old-Squaw** (CLANGULA HYEMALIS). Marine duck of the n. Atlantic coast, peculiar in having the middle tail feathers as long as half the body.

**Old State House.** In Boston: erected 1712. It took the place of a Town House built 1658 and burned 1711.

**Old Style.** The Julian Calendar gave 365 days to the year, and to each fourth year 366. This excess of a little more than 11 minutes in the actual length of the year had by the 16th century somewhat deranged the ecclesiastical calendar. So, to harmonize the civil with the solar year, Pope Gregory issued a new calendar 1582, dropping ten days, Oct. 5 becoming Oct. 15 in all R.C. countries. In England the New Style did not come into use till 1752, when Sept. 3 became Sept. 14. The Old Style is still followed in Russia. The difference between Old Style and New Style is now 12 days. See CALENDAR.

**Old Testament.** Jewish Scriptures: in the Protestant canon, 15 historical books, including Ezra and Nehemiah; 8 poetical, counting in Ruth, Esther, and Lamentations; and 16 prophetical.

**Oldys,** WILLIAM, 1696–1761. English bibliographer. *British Librarian*, 1737; *Harleian Miscellany*, 8 vols., 1753.

**Oleaceæ.** Natural family of flowering plants, of the class *Angiospermæ*, sub-class *Dicotyledons*, and series *Gamopetalæ*, comprising 19 genera and ab. 300 species, natives of the warm and temperate regions of both hemispheres; called the Olive family.

**Oleander.** *Nerium oleander*. Evergreen showy-flowered shrub of the natural family *Apocynaceæ*, native of the Levant;

Common Oleander (*Nerium oleander*).

widely cultivated for ornament; called Rose Bay. It contains an acrid juice which is injurious to men and cattle. The steeping of the stems in streams kills the fish therein.

**Oleaster.** Shrubs of the genus *Elæagnus*, natural family *Elæagnaceæ*, bearing whitened, narrow leaves and odorous yellow flowers; sometimes planted for ornament; native of s. Europe.

**Ole Bull.** See BULL, OLE.

**Olefiant Gas.** See ETHYLENE.

**Olefines** (ETHYLENES). Hydrocarbons corresponding to the general symbol $C_nH_{2n}$. Ethylene ($C_2H_4$) is the most prominent of this class. They all unite easily with chlorine, bromine, and sulphuric acid.

**Oleic Acid.** $C_{18}H_{34}O_2$. Liquid acid, solidifying to white needles in the cold; mpt. 14° C.; sp. gr. 0.808; combined in many vegetable and animal fats with glyceryl, especially in olive and almond oils; obtained by the decomposition of these fats by alkalies or water. The red oil of trade is mainly oleic acid. The sodium salt of oleic acid is present in many soaps; its potassium salt is a liquid soap used in pharmacy. The acid is tasteless and colorless, but rapidly becomes yellow and rancid on exposure to the air. It is decomposed by distillation. It was discovered by Chevreul 1811.

**Oleins.** GLYCERIDES (q.v.) or glyceryl combinations with oleic acid. Triolein is a liquid and the main constituent of olive oil; it is present in vegetable and animal fats. The oleins yield glycerin and soaps when treated with alkalies.

**Oleograph.** Chromo-lithograph which has been mounted on canvas and varnished to imitate an oil painting.

**Oleomargarine.** Mixture of oleo oil, neutral lard, some liquid vegetable oil, as cotton-seed, sesamé, or peanut, butter in the higher grades, cream and milk, with salt and annatto, or other coloring matter. The manufacture of oleo oil is carried on in abattoirs. The caul and suet fats are placed in tanks containing water at a temperature of 75°–85° F., then transferred to ice water, after which it is hashed, rendered, and filtered through cloth by pressure. The expressed oil is known as oleo oil; this is allowed to cool. In this condition it is soft, somewhat granular, tasteless, and almost colorless. Oleomargarine is often sold for butter. If well made, it can be distinguished from genuine butter only by experts. Many of the States and the general Government have passed stringent laws governing the manufacture and sale of all imitation butters. Various trade names more or less definitely indicating their origin are applied to various brands of artificial butter; *e.g.*, suine, butterine. Mege-Mouries in Paris 1870 made artificial butter by a method similar to the above. U. S. levies a tax of 2 cts. per pound on butter substitutes; in 1894 the amount collected was $1,723,479.90.

**Oleometer.** AREOMETER (q.v.) used in determining the density of fixed oils.

**Oleo Oil.** Semi-solid animal oil, containing tristearin, tripalmitin, and triolein; produced by pressing rendered animal fat and removing its solid part. Churned with milk, it is used for the manufacture of oleomargarine.

**Oleo Phosphoric Acid.** Yellow, sticky substance, found

in the brain; containing from 1.9 to 2 per cent of phosphorus. A similar substance is present in the yellow part of the eggs of certain fishes.

**Olevianus,** KASPAR, 1536–1587. German reformer; author, with Ursinus, of the Heidelberg Catechism, 1563.

**Olga,** ST., d. 968. Regent of Russia 946–955, canonized for her efforts in later life to Christianize the country.

**Olibanum.** Gum resin which exudes from the tree *Boswellia serrata*, which grows in India and Africa. It has been the favorite basis of incense from the earliest times. The Egyptians employed it for fumigations and in embalming. See FRANKINCENSE.

**Oligandrous.** Flowers with few stamens.

**Oligarchy.** Government neither by a king, by the whole body of nobles, nor by the people, but by a few; *i.e.*, an exclusive clique; generally detested.

**Oligocene.** In Geology, upper Eocene and lower Miocene.

**Oligochæta.** Hermaphrodite, chætopod Annelids, without pharyngeal armature, parapodia, tentacles, cirri, or branchiæ. There are a few setæ on the sides of the body; the upper lip forms a præstomium. The common Earthworm (Angleworm) is typical. See LUMBRICUS. They are classed in two groups, *Terricolæ* and *Limicolæ*.

**Oligoclase.** Variety of feldspar; a sodium-calcium-aluminium silicate, intermediate in composition between albite and anorthite. It is a common ingredient in many crystalline rocks of a granitic type.

**Oligosporea.** See COCCIDIA.

**Oliphant,** CAROLINE. See NAIRNÉ.

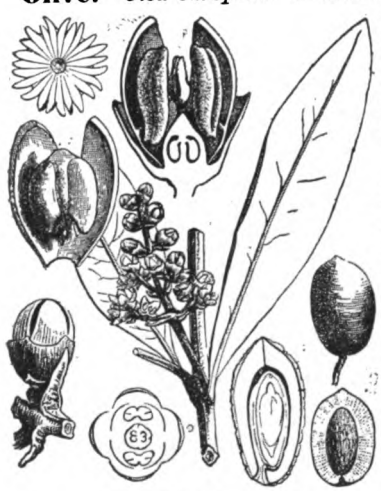
**Oliphant,** LAURENCE, 1829–1888. English author, long in Asia and America; M.P. 1865–68. Besides many works of travel, he pub. 3 novels, *Piccadilly*, 1870, *Altiora Peto*, 1883, and *Masollam*, 1886. His peculiar views were set forth in *Sympneumata*, 1886, and *Scientific Religion*, 1888.

**Oliphant,** MRS. MARGARET (WILSON), b. 1818. Scottish novelist, biographer of Edward Irving, 1862, Dr. Chalmers, 1893, and others. *Makers of Venice*, 1888; *Victorian Age*, 1893. Prominent among her many novels are *Margaret Maitland*, 1849, and *Chronicles of Carlingford*, 1861–64.

**Oliphant,** THOMAS LAWRENCE KINGSTON, b. 1831. English writer on biography and language.

**Olivarez,** GASPARO DE GUZMAN, COUNT OF, 1587–1645. Spanish Prime Minister 1621–43. His oppressive government provoked revolts, led to the loss of Portugal, and ended in his exile.

**Olive.** *Olea europæa.* Small evergreen tree of the natural family *Oleaceæ*, native of w. Asia and perhaps of s. Europe, widely planted in warm regions for its fruit. The name is wrongly applied to several different tropical trees.



Olive (*Olea europæa*).

**Olive,** CHINESE. *Canarium commune.* Tree of the natural family *Rutaceæ*, native of Malaya. An oil is obtained from the fruit, and the substance known as Gum Elemi exudes from the stems.

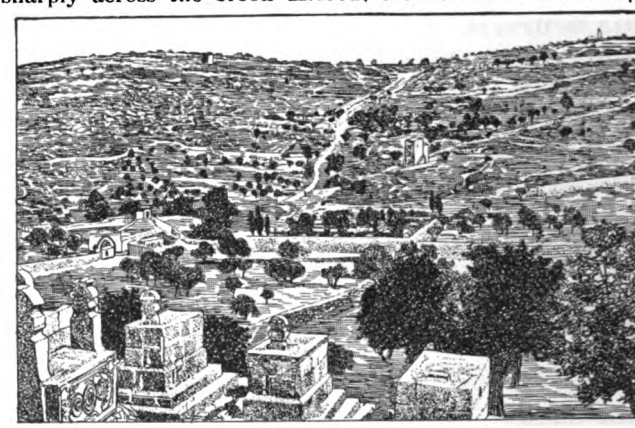
**Olive,** PRINCESS. Mrs. Olivia Terres, 1772–1830; pretender, who claimed to be the daughter of the Duke of Cumberland, brother of George III. In 1866 a jury decided against her claim.

**Olivenite.** $Cu_4As_2O_9+H_2O$. Hydrous copper arsenate, usually olive-green, found in many localities associated with ores of copper as a product of alteration. Fine specimens have been obtained from Cornwall and from Utah.

**Oliver,** GEORGE, D.D., 1782–1867. English writer on Masonry.

**Olivers,** THOMAS, 1725–1799. One of Wesley's helpers; author of the hymn, *The God of Abram Praise.*

**Olives,** MOUNT OF, or OLIVET. Hill e. of Jerusalem, rising sharply across the brook Kidron, 300 ft. above the Temple



Mount of Olives: Garden of Gethsemane, Tomb of the Virgin.

Mount; noted in the history of our Lord, and the scene of his Ascension.

**Olivetans.** Order founded at Siena 1313 by G. Tolomei.

**Olivet College.** At Olivet, Mich.; opened 1859. It has 12 professors, 12 assistants, 144 collegiate and 193 preparatory students.

**Olividæ.** See RHACHIGLOSSA.

**Olivier,** JUSTE DANIEL, 1807–1876. Swiss poet and historical writer, long resident in Paris.

**Olivine.** See CHRYSOLITE.

**Olla Podrida.** Spanish mixture of meats and vegetables, cut fine and stewed; figuratively, a miscellaneous collection of any sort.

**Ollendorf,** H. G., 1803–1865. German author of sundry grammars, on a system of his own.

**Ollier,** LOUIS XAVIER, b. 1825. Prof. Paris; writer on pathology.

**Ollivier,** ÉMILE, b. 1825. French author; Deputy 1857; Prime Minister and Academician 1870.

**Olmedo,** JOSÉ JOAQUIN DE, 1780–1847. Spanish-American poet, long prominent in the affairs of Ecuador.

**Olmsted,** DENISON, 1791–1859. Prof. Univ. N. C. 1817; prof. Yale from 1825. He made a geological survey of N. C., believed to be the first in the U. S., pub. 1824–25; pub. a theory of hail-stones 1830, and made studies of meteors and the aurora. *Natural Philosophy*, 1831–32; *Astronomy*, 1839–41.

**Olmsted,** FREDERICK LAW, b. 1822. American landscape architect, designer of many parks. *Farmer in England*, 1852; *Journey in Texas*, 1857.

**Olmütz.** Capital of Moravia till 1640; on the March; long ruled by its bishops. It had a university 1581–1855, now a theol. sem. Pop., 1890, 19,761.

**Olney.** Village of Buckinghamshire, on the Ouse; residence 1767–86 of Cowper, who with John Newton pub. the important *Olney Hymns*, 1779. Pop. ab. 2,400.

**Olney,** EDWARD, LL.D., 1827–1887. Prof. Univ. Mich. from 1863; author of mathematical text-books.

**Olney,** JESSE, 1798–1872. Teacher in N. Y. and Conn.; founder of the modern method in geography; author of popular school books.

**Olney,** RICHARD, b. 1835. Boston lawyer; U. S. Atty.-gen. 1893; Sec. of State 1895.

**Olozaga,** SALUSTIANO, 1803–1873. Prime Minister of Spain 1843; thrice envoy to France; Pres. Cortes 1869 and 1871.

**Olshausen,** HERMANN, 1796–1839. Prof. Königsberg 1827, Erlangen 1831. *Commentary on N.T.*, begun 1830, tr. 1847–49.

**Oltenitza.** Village on the Danube; scene of the first battle of the Crimean War, a repulse of Russians by Turks, Nov. 1853.

**Olustee.** In Fla.; scene of a defeat of Union forces Feb. 20, 1864.

**Olympia.** Plain in Elis, Greece, containing the sacred grove of Zeus, with numerous temples, statues, etc. Most famous was the temple of Olympian Zeus, with its chryselephantine

statue of the god by Phidias. Excavations were made here in 1875 by the Prussian Government. The objects found are at Olympia, the Germans having only the privilege of making casts. Chief among the discoveries were the shattered remains

Olympia (restored).

of the gable sculptures of the temple of Zeus, a *Mercury* holding the infant Bacchus, by Praxiteles, and a *Victory* by Pæonius. The temples at Olympia are wholly ruined. The best preserved is the temple of Hera, of which only the lower portions of the columns are standing.

**Olympiad.** Chief chronological era among the Greeks, beginning with 776 B.C. Each Olympiad covered four years. The Olympic games occurred in the first year of each period.

**Olympias,** d. 316 B.C. Wife of Philip II. of Macedon, mother of Alexander. She left Macedonia 338 B.C., seized the supreme power 317, and was killed by Cassander.

**Olympic Games.** Celebrated at Olympia in Elis every 4th year, instituted in very early times and revived ab. 825 B.C. War was forbidden, and Elis held as sacred ground, during the month in which the games occurred. Only persons of pure Hellenic blood could compete; slaves and women were excluded from the exhibition, though women were allowed to send chariots to the races. The contests were 24 in all, including, besides chariot races, foot races, boxing and wrestling for men and boys. After 456, dramas and works of art were exhibited. At first the games occupied one day, afterward five. Judges were appointed by the Eleans; places were assigned by lot: the prize was a garland of wild olive. The victor on his return home entered the city in triumphal procession. The festival was abolished 394. Smaller festivals called Olympic were celebrated at many Greek cities. The Olympic games were revived in Athens 1896 with much success. Eleven of the events were won by Americans.

**Olympiodorus.** 1. Egyptian author of a Greek history in 22 books, extending 407–425. 2. Neoplatonist of Alexandria ab. 500.

**Olympus.** 1. Range of mountains between Thessaly and Macedonia, ab. 9,700 ft. high; in mythology, its summit famed

Olympus.

by Homer and other poets as the residence of the gods. 2. Chain of mountains in n.w. Asia Minor.

**Olynthus.** Ideal simple sponge, supposed by Haeckel to have been the ancestor of all sponges. It is a cup-shaped organism; the mouth of the cup is the osculum; ostia or pores open through the side walls. Ectoderm of pinnacocytes, mesoderm of collencytes, and an endoderm of choanocytes are present. See ASCETTA.

**OM.** Mystic syllable of high importance in the Hindu religion; origin unknown. Its first meaning seems to have been solemn affirmation. The three letters by which it is expressed in Sanskrit, A U M, make it a symbol of the Trinity.

**Omaha.** Capital of Douglas co., Nebraska; most important city and railroad terminus of the State; on the Missouri, upon the sides of the river bluffs and on the rolling prairie above; founded 1854. Its trade and manufactures are extensive, especially in pork-packing and silver-smelting. Pop., 1890, 140,452.

**Omaha Indians.** Of Sioux descent, ab. 1,000 are now on a reservation in e. Nebraska, reported to be peaceful and industrious.

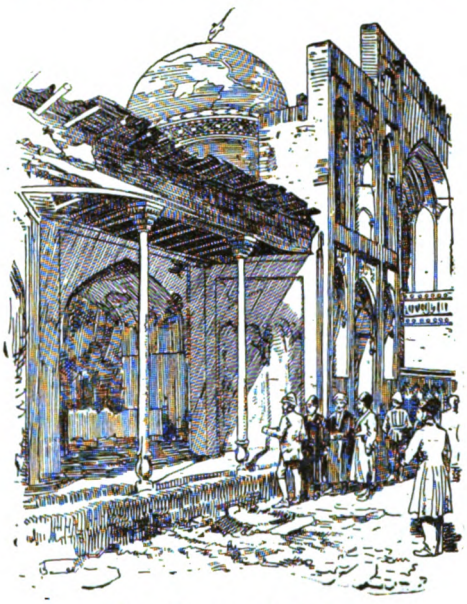
**Oman.** E. part of Arabia, nominally ruled by the Sultan of Muscat. Area 82,000 sq. m.; pop. ab. 1,500,000.

**Oman,** VICTOR EMANUEL, Ph.D., b. 1833. Swedish poet, translator, and lexicographer.

**Omar,** ab. 581–644. Second Mohammedan caliph, succeeding Abubekr 634; conqueror of Syria, Egypt, and Persia.

**Omar,** MOSQUE OF. At Jerusalem. One of the most beautiful buildings of the Mohammedan world; dome-shaped above, with polygonal form below, wholly covered with tiles having green and blue ornament. Generally dated to the 7th century. Fergusson believed it to have been originally a Christian church of the 4th century.

**Omar Khayyam,** ab. 1050–ab. 1122. Persian astronomer and agnostic poet. His *Rubaiyat* (quatrains) owes its great



Tomb of Omar Khayyam at Nishapur, Persia.

modern fame to the splendid translation of E. Fitzgerald, 1859–68, which may be instructively compared with several later and very inferior renderings.

**Omar Pasha** (MICHAEL LATTAS), 1806–1871. Austrian pervert to Mohammedanism 1833; promoted by Abdul-Medjd from 1839; Field-Marshal 1846; distinguished in arms on the Danube and in the Crimea 1853–55; Minister of War 1869.

**Omasum.** See PSALTERIUM.

**Ombre.** Spanish game, played with 40 cards by 2, 3, or 5 persons; formerly popular in England.

**O'Meara,** BARRY EDWARD, 1786–1836. Irish naval surgeon, in attendance on Napoleon 1815–18, and the biographer of his exile 1822.

**Omelet.** Dish of fried eggs, often sweetened or flavored with herbs or ham.

**Omens.** Signs anciently supposed to denote coming good or evil fortune; often prodigies, sometimes common incidents; studied and interpreted among the Romans by haruspices.

**Omish.** Variety of Mennonites, chiefly in Pa.

**Ommateal.** Eyes made up of Ommatidia.

**Ommatidium.** Structural element of compound eyes. It

consists of a circle of pigmented cells (retinulæ), inclosing two to four clear cells, the retinophoræ.

**Ommiades,** or OMAYYADS. Second dynasty of Arabian caliphs, reigning in Damascus 661–750; also in Cordova, Spain, 755–1031.

**Omne ovum ex ovo.** Expresses Weismann's theory that all eggs are direct descendants of the egg as are the other cells of the body; *i.e.*, without the interpolation of an alternate generation of somatic cells. He extends the doctrine even to cases of alternate generation as in *Hydroids.*

**Omne vivum ex ovo.** All living things come from the egg. Biological dictum, opposed to the once prevalent idea of spontaneous generation or the production of living things from dead matter. More strictly true as "*Omne vivum ex vivo.*" *Bacteria*, e.g., do not propagate by true eggs.

**Omnibus.** Public conveyance introduced in Paris 1820; anticipated by a vehicle patented by Pascal 1662; generally used in London since 1829; in American cities mainly superseded by street-cars.

**Omnis Cellula e Cellula.** Every cell from a cell. Biological dictum, opposed to the once prevalent idea that a cell can be formed independently of a pre-existing cell; based on the fact that cells are the offspring of cells, and not of unorganized protoplasm; *i.e.*, that all cells are formed by a division of the mother cell. The essential part of a cell is the aggregation of chromatine granules in the nucleus, and any one or more of these can reproduce a cell under favorable circumstances.

**Omniscience.** Universal knowledge of past, present, and future; attribute of Deity.

**Omnivora.** See BUNODONTIA.

**Omoplatoscopy,** or SCAPULIMANCY. Divination by shoulder-blades; practiced by the Thibetans, who use those of a sheep, charred over a fire. Determinations are made from the cracks and the color of the bone, the latter to foretell the weather.

**Omostegite.** Part of the branchiostegite or carapace of lobsters, etc., posterior to the cervical groove.

**Omosternum.** That part of the sternum in Vertebrates (as in Frog), which projects in front of the attachment of first pair of ribs or of the clavicle.

**Omphacite.** Green variety of the mineral pyroxene, associated with garnet in eclogyte.

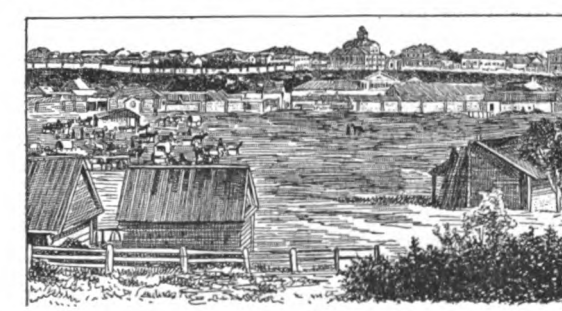
**Omphale.** Queen of Lydia, whom Hercules served as a slave, wearing a woman's dress and spinning, while she put on the lion's skin and bore the club.

**Omphalodium.** Central portions of the hilum of seeds.

**Omphalo-Mesenteric** (or MESERAIC) **Vessels.** Veins or arteries that are in relation with the yolk-sac in early embryos; also called vitelline vessels; properly restricted to the vitelline trunk above the junction of splanchine branches. Near the heart it is the sinus venosus. In the liver it is the ductus venosus.

**Omri.** Usurping King of Israel ab.932–918 B.C.; father of Ahab. He made Samaria the capital ab.924.

**Omsk.** Town of w. Siberia, on the Irtish, at the mouth of the Om, 1,624 m. from Moscow; junction of the highways to



Omsk.

Russia, Orenburg, E. Siberia and Turkistan. It is built of wood on a sandy plain, and is the seat of administration of the Siberian-Cossacks; founded 1716. Pop., 1890, 38,000.

**On,** or HELIOPOLIS. Ancient city of Egypt, near the site of Cairo; seat of sun-worship.

**Oña,** PEDRO DE, ab.1565–ab.1640. Chilian epic poet, imitator of Ercilla's *Araucana.*

**Onagraceæ.** Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Dicotyledons*, comprising ab. 40 genera and ab. 500 species, widely distributed throughout the temperate regions of the earth; called the Evening Primrose family.

**Onamacritus,** ab.530–480 B.C. Athenian orphic poet, patronized by the Pisistratidæ.

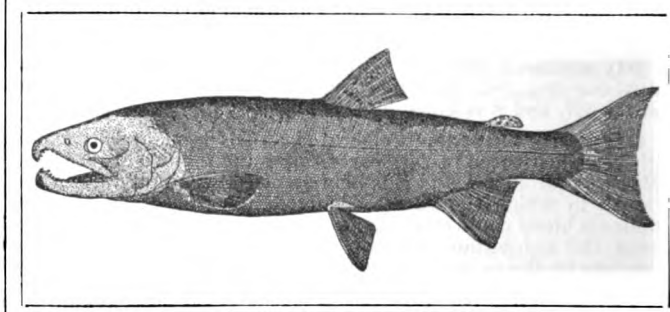
**Onate,** JUAN DE, b. ab.1555. Colonizer and Gov. of New Mexico 1599–ab.1608.

**Onchidium.** Genus of Pulmonates of the sub-group *Stylommatophora.*

**Onchus.** Compressed, slightly curved, fluted spines supposed to belong to a shark-like fish; found in the Upper Silurian of England, and recently in the Middle Silurian of Pa.

**Oncken,** JOHANN GERHARD, d. 1884. German Baptist evangelist.

**Oncorhynchus.** Genus of *Salmonidæ*, of which *O. tchawytcha* is the Quinnat or Columbia River Salmon, an anadromous fish averaging 22 lbs., though individuals may exceed 100 lbs. Four other species of this genus run in the Pacific rivers. The quinnat and blueback salmon run in the spring, others in the fall, when the flesh is inferior. The young are called Grilse. The distance from the ocean to the spawning grounds is from 400 to 800 m. After spawning the fish die. The flesh is reddest in the spring, becoming whitish in the fall, owing to loss of oil, for the fish do not feed while in the river.



The Kisutch, or Silver Salmon.

During the development of the milt the male attains peculiar sexual characters: the lower jaw grows long and hooked, the front teeth grow long, a hump develops on the shoulders, the teeth on the tongue and vomer are reduced, the scales of the back are replaced by a growth of spongy skin, the color becomes blotchy red or blackish. These changes are completed by fall, whether the fish be in salt or in fresh water. The progress up stream is ab. 2 or 3 m. per day. Those starting in the fall do not go so far, and often choose smaller streams. 25,000,000 lbs. of salmon were packed on the Columbia in 1880. The Silver (or white) Salmon, *O. kisutch*, ascends all Pacific rivers as far south as the Sacramento.

**Ondricek,** FRANZ, b. ab.1863. Bohemian violinist, heard in London from 1885, in America 1895.

**Onega.** Lake of Russia, connected with the Gulf of Finland by the Svir River, Lake Ladoga, and the Neva. Area 4,856 sq. m.

**Oneida.** Conglomeratic base of the Medina Sandstone. See SILURIAN.

**Oneida,** LAKE. Between Oswego, Oneida, Onondaga, and Madison counties, N.Y., 10 m. n.e. of Syracuse. It is 20 m. long and 5 m. wide, and drained by the Oneida River. Alt. 360 ft.

**Oneida Community.** In Madison co., N. Y., on Oneida Creek; founded 1848 by JOHN H. NOYES (q.v.). They called themselves Perfectionists, held that the second coming of Christ took place 70, and allowed freedom of sexual intercourse. In 1880, owing to outside opinion, marriage was introduced, the property was divided and the community reorganized under the State laws as a joint-stock corporation.

**Oneida Indians.** See HURONS and IROQUOIS.

**One Old Cat, Two Old Cat.** Simpler and probably earlier games of baseball. The former is played by three or more persons, one acting as catcher, one as batsman, and one as pitcher: any others become fielders. When only three or four are playing, it is customary for the batsman when he hits the ball to run to the pitcher's place and back. When there are more men, there may be two or three batsmen, and they may run the bases as in a regular game. Two Old Cat has two batsmen facing each other, and two catchers or pitchers, who

alternately pitch and catch. The batsmen then run from one home base to the other, more after the fashion of cricket.

**Onesander,** 1st cent. Greek author of a treatise on generalship.

**Onesimus.** See PHILEMON.

**Onion.** *Allium cepa.* Bulbous herb of the Lily family, native of the Old World; widely cultivated as a food-plant.

**Oniscus.** See ISOPODA.

**Onkelos.** Author of a Targum on the Pentateuch.

**Onomatopœia.** Effort to make the sound an echo to the sense. In words: *murmur, whisper, hiss;* (Latin) *susurrus.* In phrase or sentence, common in poetry: "Myriads of rivulets hurrying through the lawns." It has been applied as a solution for the problem of the origin of language.

**Onondaga.** Thick mass of party-colored shales, calcareous above, lying in the Upper Silurian of e. N. America. The oldest N. American Placoderm, Palæaspis, occurs in this stratum in Pa., where the formation is 15,000 ft. thick.

**Onondaga,** LAKE. In Onondaga co., N. Y., 6 m. n.w. of Syracuse. Salt springs are found on its borders.

**Onslow,** GEORGE, 1784–1852. English composer, whose chamber music maintained popularity for many years. He wrote three comic operas, which failed.

**Ontario.** Province of Canada; area 222,000 sq. m. The surface is undulating, and in places hilly, rising n.e. The densest settlement is along the shores of the lakes. The leading industry is agriculture, the principal crops being the cereals and fruit. Lumbering is important, and the province has a large commerce by way of the lakes and its excellent railroad system, which had an extent. 1893, of ab. 7,500 m. The capital is Toronto. Ottawa, one of its largest cities, is the capital of the Dominion of Canada. O. was called Upper Canada, or Canada West 1791. It was originally a part of the French possessions, and passed to England with the other French territory 1763. The provinces of Upper and Lower Canada were united 1840, and received the name O. in 1867, when they united with Nova Scotia and New Brunswick to form the Dominion of Canada. By 1873 all British N. America had joined the confederation except Newfoundland. Pop., 1891, 2,214,321.

**Ontario,** LAKE. One of the Great Lakes of N. America, between N.Y. and Canada; drained by the St. Lawrence. Area 7,240 sq.m., length 190 m., breadth 54 m., elevation 247 ft., area of drainage basin 30,790 sq. m., extreme depth 738 ft.

**On the Bow.** Arc of the horizon, comprehending ab. four points of the compass on each side of the point to which a ship is directed.

**On the Quarter.** Arc of the horizon, comprehending ab. four points of the compass on each side of that point toward which the ship's stern is directed.

**Ontogeny.** Life history or development of the individual organism; identical with embryology in its broadest sense, including all the changes from the egg to full maturity. According to Haeckel, it is a condensed review of the history of the ancestors of an organism, or the epitome of the phylogeny of the taxonomic group to which the particular organism belongs. See PHYLOGENY.

**Ontology.** Metaphysics; science of Being, in contrast with phenomenology, the science of phenomena. It concerns the nature, as the latter concerns the laws of reality.

**Onus Probandi.** Burden of proof. In law it rests on the plaintiff.

**Onychodus.** Huge Lepidoganoid fish from the Devonian of Ohio, with a cartilaginous skeleton, but teeth long and formidable.

**Onychophora** (PROTOTRACHEATA). Class of tracheate Arthropods, including only *Peripatus.* The body is worm-like, with 14 to 30 or more pairs of short clawed and jointed legs. A pair of ocelli and a pair of jointed antennæ are present. It is viviparous; nearly a year is required for gestation. It lives beneath decaying wood at the Cape of Good Hope.

**Onyx.** $SiO_2$. 1. Variegated chalcedony, with the different colors arranged in thin parallel plates: material used in making cameos. 2. Onyx marble, a travertine, or stalagmitic variety of calcite, translucent, variegated in color, and often delicately shaded in wavy bands. It has a beautiful appearance when polished, and is much used in the manufacture of ornamental articles of many kinds. This variety is often called Mexican onyx. It is found in Algeria, Mexico, Arizona, and Lower California, but the deposits are usually small. In origin it is considered to be produced by the action of springs or of other waters containing calcium carbonate in solution.

Onyx Cameo.

**Oöcysts.** Chambers that receive the eggs, in certain *Polyzoa.*

**Oœcium.** Modified bud or zoöid in a bryozoan colony, which receives the fertilized ova and holds them during development.

**Oögamy.** In Botany, conjugation of dissimilar gametes.

**Oögenesis.** Life-history or development of an egg from the period when it exists as a germ cell in an embryo until it is ready for fertilization at the period of sexual maturity.

**Oögenetic Plasm.** That part of the IDIOPLASM (q.v.) in an egg which is destined to produce the eggs or spermatozoa of the individual which is to develop from the egg.

**Oögone** (OÖGONIUM). Female organ of reproduction in certain *Algæ* and *Fungi* before fertilization.

**Oökinesis.** KARYOKINESIS (q.v.) of an egg cell during its maturation phases, or even of the entire period of oögenesis.

**Oölite.** $CaCO_3$. Limestone composed of pellets or small spherical concretions like the roe or eggs of a fish; also, large group of strata characterized by such limestone. See TABLE and JURASSIC.

**Oömycetes.** Sub-class of *Fungi,* characterized by the formation of oögones, the sexual reproductive organs.

**Oöphyta.** Class of *Thallophyta,* distinguished by the production of oöspheres, including the rock-weed and some other large *Algæ,* and numerous genera of *Fungi.*

**Oöphyte.** Sexual generation of *Pteridophyta;* prothallium; also known as Oöphore.

**Oort,** HENRY, b. 1836. Dutch rationalist, prof. Leyden 1875. *Baalim,* tr. 1865; *Bible for Learners,* 6 vols., tr. 1878–79.

**Oösperm.** Fertilized ovum.

**Oösphere.** Protoplasmic mass in the female organ of reproduction in certain *Algæ* and other cryptogamic plants, before fertilization.—In Biology, ovum when ready to extrude polar globules, direction corpuscles, etc.

**Oöspore.** Oösphere of certain *Algæ* and *Fungi* after fertilization.—In Biology, immature ovum.

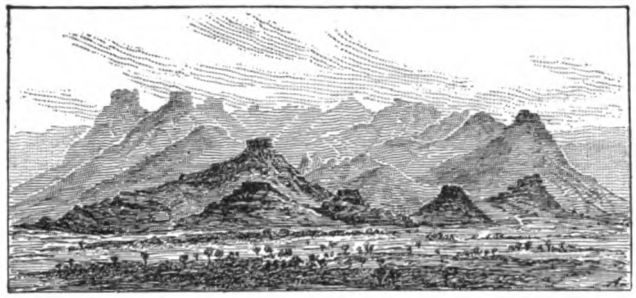
**Oöstegites.** Lamellar appendages on the thoracic feet of certain *Crustacea,* to which the eggs are attached while developing.

**Oosterzee,** JAN JACOB VAN, 1817–1882. Dutch evangelical, prof. Utrecht 1862. *Image of Christ,* 1855–61, tr. 1874; *Theology of N.T.,* 1867, tr. 1870; *Dogmatics,* 1872, tr. 1874; *Moses,* tr. 1876; *Practical Theology,* tr. 1878; *Autobiography,* 1883.

**Ooze.** Deposits found at the bottom of the deeper parts of the sea. See GLOBIGERINA, FORAMINIFERA, and RADIOLARIA.

**Opacite.** Minute, undetermined, opaque grains, sometimes seen in rock-sections under the microscope; so named by Vogelsang.

**Opal.** $SiO_2$. Amorphous variety of silica, in some respects resembling amorphous quartz, but of less hardness and of lower specific gravity. It usually contains three to nine per cent of water. Common opal is of abundant occurrence at the outlets



Opal Mines of Queensland.

of siliceous springs; it is also the usual mineral substance of petrified wood and of infusorial earth. Precious opal shows a beautiful play of colors, sometimes fire-like, but is rarely found in pieces larger than a small hen's egg. It occurs in Mexico, Honduras, Hungary, and Australia.

**Opaque.** Bodies incapable of transmitting luminous rays. Most substances, if the layer be thin enough, transmit light at least to a small degree; *e.g.*, very thin gold leaf transmits a greenish light, though gold is ordinarily supposed to be opaque.

**Opechancanough's War.** In Va., 1622. Powhattan's successor, bitterly hostile to the English, concerted a plan to exterminate them at a blow, and so far succeeded as to slay 347 persons; Jamestown and some places near it escaped. From this and other calamities the settlements were reduced from 80 to 8.

**Open Channel.** Trough, canal, or aqueduct, in which water flows with its natural slope; distinguished from a closed channel or pipe. The velocity of flow is proportional to the square root of the product of the slope by the hydraulic radius.

**Open-Cut,** or OPEN-WORK. In Mining, excavation at the surface, that does not extend underground.

**Open Hearth Process.** See STEEL, METALLURGY OF.

**Opening the Trenches.** Breaking ground of the besiegers in making the approaches toward a fortified place in siege operations. It includes the establishment of the depots and magazines and the establishment of the first parallel from which the zigzags are to proceed.

**Opequan,** BATTLE OF. Sept. 19, 1864. See WINCHESTER.

**Opera.** Dramatic composition in which music is an integral part: it roots in the ancient Greek tragedy, of which music was a part, the dialogue being chanted, the choruses having a more elaborate melodic structure and (probably) instrumental accompaniment. The effort of a coterie of literati at Florence ab. 1600 to revive the ancient tragedy gave rise to the opera. These men became dissatisfied with the musical art of their day, which gave no heed to the words, they being lost in the contrapuntal web; they invented the solo style, in which the sentiment of the words was sought to be heightened by means of melody and a support of harmonic chords. This was called Monody. They began with excerpts from secular and biblical poetry. In 1594 they produced a musical play, *Dafne*, for which Rinuccini wrote the words and Peri and Caccini the music. The same composers afterward set the same poet's *Euridice*. Peri's version was produced and pub. 1600. With this work, aided greatly by a book of monodic songs by Caccini, *Nuove musiche*, 1602, the new style began its career of conquest, being developed by Monteverde, Allessandro Scarlatti, Leo, Durante, in Italy, Lulby, Monsigny, Philidor, Gretny, in France, Schütz, Keiser, Handel, in Germany, Purcell and others in England. The original purpose of the Florentine reformers, which was to use music as a means of heightening the effect of the poetry, was soon lost, and, from that time till the agitation begun by Gluck, music was the end instead of the means. The agitation begun by Gluck was continued by Weber and brought to a culmination by Wagner. The first representation of an Italian opera in the U.S. was given 1825 in New York; it was Rossini's *Barber of Seville*.

**Opera,** KINDS OF. Distinctions of style, as formerly made, are seldom thought of. Until ab.1850 designations based on subject and manner of treatment prevailed. Italian designations were *Opera seria, buffa*, and *semiseria*. In the first the subjects were tragic, and the dialogue was carried on in *recitativo stromentato* (see RECITATIVE); in the second in *recitativo secco;* in the *opera semiseria* a serious subject was enlivened with comic episodes. The French designations, corresponding with the first two Italian, are *grand opéra* and *opéra comique*. *Opéra bouffe* is a farce, generally satirical, with spoken dialogue. This is also an element of the German *Singspiel*, whose subjects were generally serious, and of English operas. It was the rule in *opéra comique* that the ending should be happy. The German *Grosse Opera* corresponds with the *Opera seria* and *Grand opéra*. The *Romantische opera* has for its subject a tale of chivalry or supernaturalism.

**Opera Glass.** Double telescope on the same principle as the telescope invented by Galileo. It is of small magnifying power, usually from 2 to 3.

**Operation,** SYMBOLS OF. There are two classes: 1. Specific, indicating well-defined processes, as plus, minus, radical. 2. General, indicating general courses of operation, as integration. These symbols, in many cases, change their significance and force in passing to the higher analysis.

**Operculata.** Group of Barnacles, containing forms in which there is no peduncle or stalk. The body is surrounded by a ring of plates, the opening of which is closed by an operculum, made from the scuta and terga; *e.g.*, the acorn shells (*Balanus*).

**Operculata.** Section of *Pulmonate* snails, in which a horny operculum is present upon the foot. See PNEUMOCHLAMYDA.

**Operculum.** 1. Horny shell carried on the posterior side of the molluscan foot, with which the aperture of the shell is closed when the animal is retracted. 2. Gill-covers of fishes. 3. Lid to the acorn shell (Barnacle). 4. Lid which closes the mouth of the sporange in certain mosses.

**Operetta.** Dramatic composition with music, in which the forms of grand opera are travestied, the dialogue is spoken, and the subject is one proper to comedy or farce. Characteristic examples in French are the *opéras bouffes* of Offenbach, and in English the comic operas of Gilbert & Sullivan.

**Ophicleide.** Bass instrument of the family of bugles; that is, brass instruments with keys, like the cornet. It was the successor of a wooden instrument called serpent, but has in time been succeeded by the TUBA (q.v.).

**Ophidia** (SNAKES). Order of Reptiles, including forms without feet and pectoral girdle. The maxillary and palatine bones bear recurved teeth and are movable, so that the prey, relatively of large size, can be swallowed whole. The eyes have vertical pupils and are covered by transparent skin. There is no tympanic cavity in the ear. The vertebræ are numerous and procœlous, articulating by a ball and socket joint, allowing lateral motion. All the trunk vertebræ bear ribs that are movably articulated, so as to form organs of locomotion, to the ventral ends of which the belly scales are attached by muscles. There is no urinary bladder. The left lung is rudimentary: the right is joined to air sacs, to allow of respiration during protracted swallowing. The tongue is forked, plays in a sheath, and can be protruded even when the mouth is shut. The larynx can be drawn forward during swallowing. Poison teeth are present in some snakes. Most are oviparous, but the *Hydrophidæ* and vipers are viviparous. The sub-orders are OPOTERODONTA, COLUBRIFORMIA, PROTEROGLYPHA, and SOLENOGLYPHA (q.v.).

**Ophidobatrachia.** See GYMNOPHIONA.

**Ophioglossaceæ.** Family of the sub-kingdom *Pteridophyta*, related to the ferns, but differing from them in the absence of the elastic ring of cells, or annulus, which surrounds the sporanges, and in other points of structure. It includes the adders-tongue and the moonworts.

**Ophiolite.** Greenish rock, consisting mainly of serpentine mixed with calcium and magnesium carbonates.

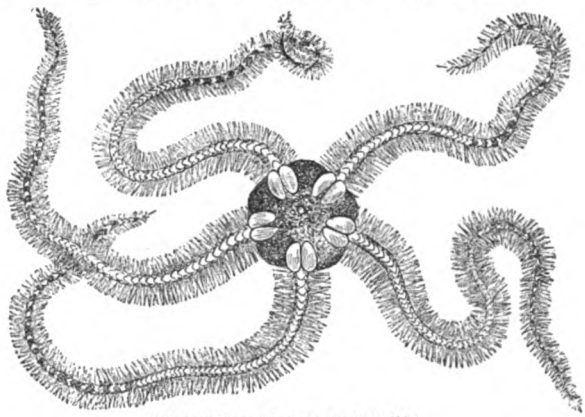
**Ophiomorpha.** See GYMNOPHIONA.

**Ophir.** Site of gold mines worked by Solomon; possibly in Africa or India, more probably in s. Arabia.

**Ophites.** Serpent-worshipers; Gnostic sect in Egypt and Asia, existing from 150 or earlier to 530, when laws were enacted against them.

**Ophiuroidea** (OPHIURIDÆ, SNAKE-STARS, BRITTLE-STARS). Echinoderms, with stellate bodies, consisting of a central disk and five slender-jointed, flexible arms, that do not contain prolongations of the viscera, and whose ambulacral grooves

are covered up by plates, so that the sucker-feet stick out at the sides. The larvæ are plutei. There is no anus. Some are



Ophiuroidea (*Ophiotrix fragilis*).

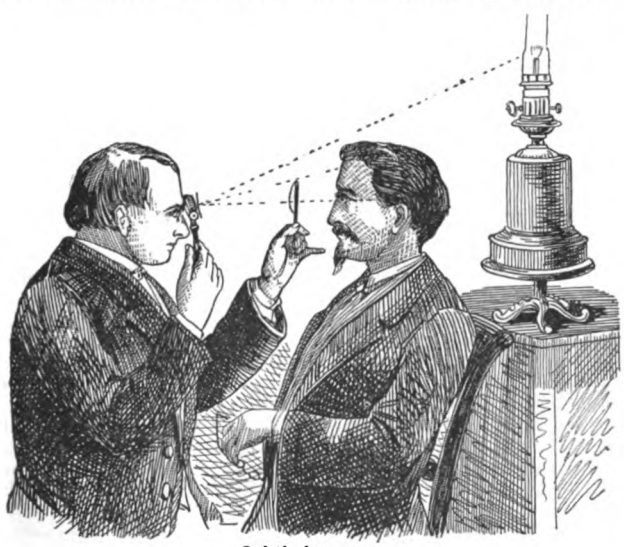
viviparous. The arms in some forms are dichotomously branched into numerous branchlets.

**Ophthalmia.** Inflammation of the mucous membrane lining the eyelids and covering the eyeball. It varies in severity from a slight bloodshot to an intense inflammation quickly involving other structures and destroying vision. One element of causation is the presence of pathogenic bacteria, hence the disease is contagious and proper precaution should always be taken to prevent its spread. In slight cases the treatment is simple, a solution of boric acid dropped in the eye several times a day sufficing. Poulticing the eye should be avoided. Severe cases tax the skill of the best ophthalmologists. Egyptian Ophthalmia is a very severe form prevalent in Egypt and other countries where there is an excess of light with abundance of dust, especially if combined with lack of personal cleanliness. Ophthalmia of the new born attacks children in the first weeks of their lives. About 20 per cent of the blind among children are from this cause. Many States now have laws compelling the immediate reporting by the attendant to the family physician or health officer of any redness seen on the white of the eye of any baby under two weeks old, under pain of heavy penalty.

**Ophthalmites.** Stalks or appendages that bear the eyes in lobsters, crabs, and similar *Crustacea*.

**Ophthalmology.** Department of medicine which treats of the care of the diseases and defects of the eye. As the eye is, at the same time, an organ of the body and an optical instrument, an acquaintance with physiologic optics is equally essential with the knowledge of the principles of medicine and surgery.

**Ophthalmoscope.** Instrument for examining the interior of the eye, invented by Helmholtz 1851. In its simplest form it consists of a small mirror with an aperture in the



Ophthalmoscope.

center through which the observer looks. In using the ophthalmoscope the interior of the eye is illuminated by rays from a light placed behind and to one side of the patient's head, and reflected through the pupil by the mirror. It is of great service in the detection and diagnosis of eye defects, and particularly with regard to the retina.

**Opie,** JOHN, 1761–1807. English portrait painter, of subordinate rank, but of historic reputation, 1761–1807.—His second wife, AMELIA (ALDERSON), 1769–1853, m. 1798, wrote novels and some highly popular moral tales for youth.

**Opisthobranchiata.** Order of *Gastropoda*, including forms which have a flat foot, with the vessels from the gills entering the heart from behind. Most are naked, or have a shell covered by fleshy lobes of the foot. Only one gill is present, and it is usually exposed. This group includes sub-orders TECTIBRANCHIATA, NUDIBRANCHIATA, and SACCOGLOSSA (q.v.).

**Opisthocœlia.** See CROCODILIA.

**Opisthocœlous.** Vertebræ which have the posterior articular surfaces of the centrum cupped to fit the convex anterior faces of the succeding vertebræ.

**Opisthocomus.** See HETEROMORPHÆ.

**Opisthodal.** Posterior orifice of a stoma, opening into the intercellular space behind.

**Opisthoglossa.** See PHANEROGLOSSA.

**Opisthoglypha.** Group of *Colubriformia*, including snakes with long grooved fangs in the back part of the mouth and solid teeth in front. Whether or not they are poisonous is a mooted question. Included are the families *Dryophidæ* and *Dipsadidæ*. See TREE SNAKES.

**Opisthomi.** See ACANTHOPTERI.

**Opisthopulmonata.** See STYLOMMATOPHORA.

**Opisthotic.** Posterior of the two ventral elements of the ear capsule of the vertebrate cranium.

**Opisthotonos.** Spasm in which the body is bent backward, as in strychnine poisoning.

**Opitz,** MARTIN, 1597–1639. German poet, critic, and translator, memorable chiefly for his past repute and his encouragement of literature in the vernacular. *Aristarchus*, 1817; *Book of German Poetry*, 1624.

**Opium.** Evaporated juice obtained from the unripe capsules of the white poppy (*Papaver somniferum*). It is cultivated largely in Egypt, Turkey and British India. It is found in the market as flattened balls, of a reddish brown color, somewhat resinous in appearance. It contains a number of alkaloids, the most important being morphine and codeine with meconic acid. The morphine varies from 3 to 15 per cent. An analysis of Smyrna opium gave morphine 10.3, codeine 0.25, narcotine 6.8, narceine 6.7, meconin 0.8, meconic acid 5.1, fat 2.2, caoutchouc 6, resin 3.6, gummy extract 25.2, gum 1, vegetable mucus 19.1, water 9.8. Its chief uses in medicine are to allay pain and produce sleep; the medicinal dose is ¼ to 3 gr. The early sensations after taking a moderate dose are sensually pleasureable, and this, in connection with its anagesic and soporific properties, easily produce opium inebriates of those who have used it occasionally. The intoxicating effects may be obtained by smoking the drug, using morphine hypodermically, or by using either opium or its preparations by the mouth. Large doses of opium are poisonous; the heart beats slowly and feebly, the respiration is slow and stertorous, the pupils contracted, and the person is either unconscious or is aroused with difficulty. Death occurs from the paralysis of the respiratory centers in the brain, in two hours or less. The smallest fatal dose was 4 gr., with infants ⅛ gr. To treat a case of opium poisoning, if possible empty the stomach; administer strong coffee freely and endeavor to keep him aroused by forced walking. Atropine and strychnine are given hypodermically. Belladonna is a physiologic antidote to opium and should be given freely to keep up the action of the heart. A large proportion of deaths by poison is due to opium and its preparations. The opium habit is very common throughout the world, 3 to 12 gr. per day being taken by an opium eater. Opium smoking is very prevalent in India and China. Morphine habit is also prevalent, taken internally or by hypodermic injection. Medicinal dose is ⅛ to ½ gr.

**Opium Smoking.** Custom of comparatively recent origin in China, where it is practiced by a large part of the population. The crude opium is prepared in China by boiling in water, filtering, and then reducing by heat to the consistency of thick treacle. The pipe consists of a bamboo tube an inch or more in diameter and ab. two feet long. The bowl is of earthenware, with a flat top with a minute orifice. The smoker reclines upon a couch, takes a small drop of the prepared drug upon the point of an iron needle, and toasts it over the flame of a lamp. The opium is then applied with the needle to the orifice of the pipe, and held over the lamp flame. As it is gradually vaporized, the smoke is drawn into the lungs with several strong inspirations. The operation is repeated until the desired effect is obtained. The practice is in general harmful, and when carried to excess leads to moral and physical deterioration. It has

been introduced by the Chinese into the U. S., leading to stringent prohibitory laws.

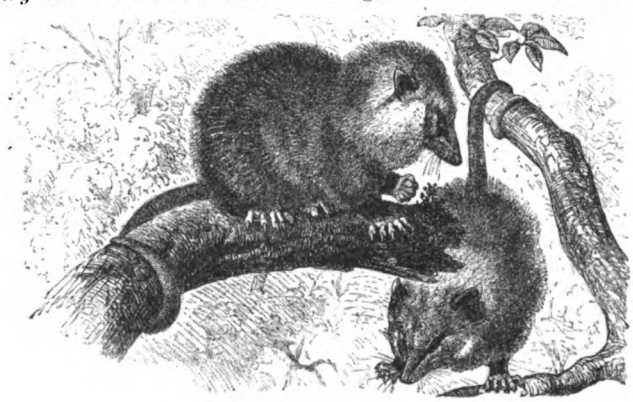
Chinese Opium Smokers.

**Opodeldoc.** Liniment prepared by dissolving soap, camphor and oil of rosemary in diluted alcohol; soap liniment.

**Opopanax.** Gum resin from *Pastinaca opopanax*, a plant much like the parsnip. It resembles asafetida, though less strong.

**Oporto.** Seaport of Portugal, second in size and commercial importance; on the River Douro, 3 m. from its mouth; besieged by the pretender Michael 1832–33. Pop., 1878, 105,838.

**Opossums.** American Marsupials of two genera. *Chironectes*, the water-opossum, living in n. Brazil, resembles the Otter. It has 6 young at a birth. *Didelphys* contains many species, ranging from the size of a mouse to that of a cat. The dentition is I $\frac{5}{4}$ C $\frac{1}{1}$ P $\frac{3}{3}$ M $\frac{4}{4}$. They have an opposable great-toe on the hind foot; the tail is naked, long, and prehensile. *D. virginiana* of N. America, 2 ft. long, besides tail, has a well-



Opossum (*Didelphys marsupialis*).

developed pouch, in which the young, about a dozen, are placed, and attached to the long teats, after a period of gestation of less than a month. They suckle thus for two months. In some species the pouch is rudimentary, and the young cling to their mother's tail with their own. Most species of opossums are S. American and insectivorous; some also secure birds and eggs; a few are strictly frugivorous.

**Opoterodonta.** Sub-order of *Ophidia*, including insect-feeding snakes, having short or rudimentary tail and traces of hind limbs. The facial bones are immovable, and the mouth not distensible. The eyes are covered by scales and are rudimentary. These animals are small and live in the earth in sub-tropical regions, coming out like earth-worms when it rains. *Typhlops* is an example: only its upper jaw bears teeth. This and the Colubriform families, *Tortricidæ* and *Uropeltidæ*, are sometimes grouped in one sub-order, *Angiostomata*.

**Oppenheim.** Town of Hesse-Darmstadt, on the Rhine. Here Conrad, son of Frederic II., was defeated 1247. Pop. ab. 3,500.

**Oppenheim,** HERMANN, b. 1858. German writer on nervous diseases.

**Oppert,** JULES, b. 1825. Prof. Coll. de France 1874; writer on Oriental antiquities.

**Oppian,** 2d cent. Greek poet, author of *Halieutica*, upon fishing, and possibly of *Ixeutica*, upon fowling, and *Cynegetica*, on hunting.

**Oppian Law.** In Rome, 213–193 B.C. It forbade women to possess more than one ounce of gold, to wear a dress of different colors, and to ride in or near the city in a carriage.

**Oppius,** GAIUS, 1st cent. B.C. Biographer of Cæsar and Scipio. Fragments survive.

**Oppolzer,** THEODORE VON, 1841–1886. Austrian author of a most complete work on Theoretical Astronomy 1870–80, and of many papers and memoirs on astronomical subjects.

**Opportunists.** Practical politicians who aim only at the possible; opposed to theorists and doctrinaires.

**Opposite.** Method of leaf arrangement, where each node of the stem bears two leaves, which then diverge from each other, as in the Sunflowers.

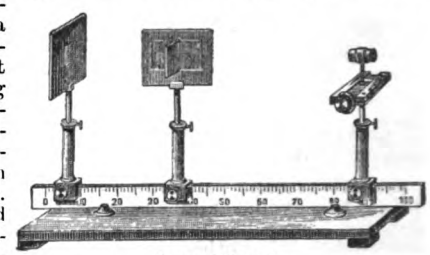
**Opposite Angles.** On opposite sides of intersecting lines or planes; opposed to adjacent.

**Ops.** Wife of Saturn; Roman goddess of plenty and fertility; protectress of agriculture.

**Opsiometer.** See OPTOMETER.

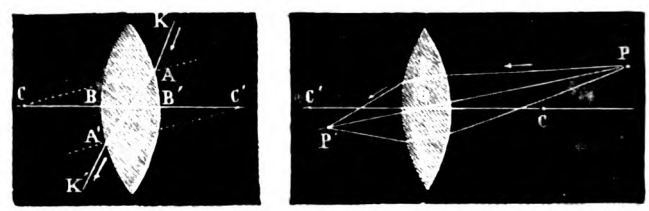
**Optatianus,** PUBLILIUS, 4th cent. Latin poet.

**Optical Bench.** Apparatus for studying the phenomena of diffraction. It consists essentially of a graduated bar carrying three upright holders sliding along the bar. The first carries a laterally adjustable Ramsden's eyepiece, furnished with a set of cross-wires. The second and third uprights carry the various diffraction apparatus, as a narrow slit, a fine vertical wire, a biprism to produce interference. By means of the biprism and slit wave-lengths may be measured with this apparatus.



Optical Bench.

**Optical Center.** Point of reference on the principal axis of a lens, so situated that any ray of light whose direction within the lens passes through it suffers no angular deviation. In a double convex or double concave lens it is within the lens. In a plano-convex or plano-concave lens it is the point where the principal axis intersects the curved surface. If the lens be




O Optical Center.

a converging meniscus, the optical center is entirely without it on the convex side; if a diverging meniscus, the point is on the concave side. In general this point is determined by drawing two parallel radii, one to each curved surface, and joining the points where these lines cut the surfaces: the intersection of this last line with the principal axis is the optical center.

**Optical Circle.** Apparatus for verifying the laws of reflection and refraction. It consists of a vertical graduated circle at the center of which may be fixed a small mirror at right angles to the plane of the circle, and around the circumference of which move two tubes with their axes always directed toward the center of the circle. The mirror is movable; to the front of the circle may be attached a cylindrical vessel half filled with water or some other transparent liquid. If a beam of light be passed down one of the tubes it becomes incident on the mirror or the surface of the water and the other tube may be placed so that the ray after reflection or refraction, as the case may be, passes through it; then by reading the position of the tubes from the arc, the various laws may be studied.

**Optical Density.** Different transparent media are found to transmit radiant energy, *e.g.*, light, with different velocities, depending upon the nature of the substance. Of two media that one is said to have the greater optical density in which the velocity of propagation is the less. Again, if a ray of light be incident upon the surface separating two media at any angle between zero and the critical angle, that medium has the greater optical density in which the ray makes the less angle with the normal at the point of incidence. Optical density and mass density often correspond, though there are several notable exceptions.

**Optical Illusion.** See MIRAGE, IRRADIATION, REFLECTION and REFRACTION.

**Optical Lever.** Apparatus employed by Laplace and Lavoisier to multiply the effect produced by the linear expansion of a rod. One end of the rod is fixed, while the other rests against the short end of a lever movable in a vertical plane

and to the long arm of which is attached a mirror or telescope directed to a vertical scale. A spot of light, if reflected from the mirror to a distant scale, will indicate by a considerable displacement any small elongation of the rod. Similarly, a considerable range of the scale will pass over the field of the telescope if the latter be used instead of the mirror.

**Optic Angle.** See OPTIC AXIS.

**Optic Axis.** The principal optic axis of the eye is a straight line through the optical center of the crystalline lens and the center of the pupil. The optic angle is that between the principal optic axes of the two eyes when directed to the same point. As the optic angle decreases as the distance of the object viewed increases, it forms an important element in judging distances. The visual angle between any two points is the angle formed by the two lines joining the points to the optical center of one eye. The visual angle is of prime importance in estimating size.

**Optic Axis** OF A CRYSTAL. See DOUBLE REFRACTION.

**Optic Nerve.** Second cranial nerve, whose special function is to convey the visual sensations from the eye to the brain. It extends from the region of visual perception in the occipital lobe of the cerebrum by way of the base of the brain to the orbit, and is distributed in the interior of the eye as the RETINA (q.v.).

**Optics.** Branch of physics which treats of the phenomena of light. It considers the theories of light; the laws of its propagation and distribution; and the methods of measuring its intensity and quantity.

**Optic Vesicles.** Buds from the fore brain, which are to be developed into the retinal portion of the eye in Vertebrate embryos.

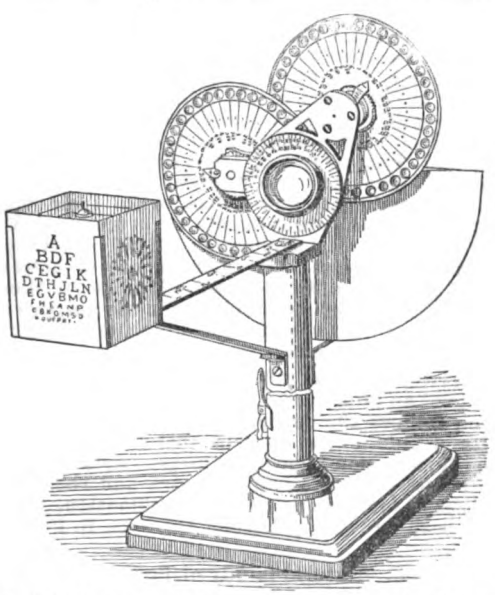
**Optimates.** Aristocratic or senatorial party in ancient Rome, opposed to the plebs or populares.

**Optimism.** View that whatever exists is good and right, and in some inscrutable way leads to good; that this either is, or tends to become, the best of all possible worlds.

**Options.** On the stock exchange, privilege of either demanding or making delivery of a certain stock or commodity at a given price within a specified time; known also as Puts and Calls.

**Optogram.** Permanent image of an external object, fixed upon the retina of an eye. A retina is of a purplish-red color. This coloring matter, called by Kühne Visual Purple or Rhodopsin, is readily bleached by light; so that Kühne obtained optograms of external objects by exposing the eye of a recently killed rabbit to a source of light, such as an opening in a shutter; and then, after removing the exposed eye, hardening the retina and fixing the image with a solution of alum. On examining the surface, a clear white image of the opening was visible upon a beautiful rose-red ground.

**Optometer,** or OPSIOMETER. Instrument devised by Stampfer for defining the distance of distinct vision. The




Berteling's Compound Optometer for Correcting Errors of Refraction.

principles upon which it depends were deduced by experiments performed by Scheiner, which consisted in viewing a small object through two minute openings very near together and then withdrawing the object till the two images were seen as one. Such is the case when the object is at a distance from the eye equal to that of distinct vision.

**Opus Operatum.** R. C. doctrine that the grace of the sacraments depends solely upon Divine institution, and not on the spiritual state of the recipient (*opus operantis*).

**Opzoomer,** CORNELIS WILLEM, b. 1821. Prof. Utrecht 1846; progressive and rationalist writer.

**Oracle.** The Greek world possessed a number of shrines where the gods were believed to answer the inquiries of men, through signs which the priests interpreted, or sometimes through a dream, as at Oropus. Dodona was the oldest in Greece: here brazen caldrons were suspended to oak trees, and these, when impelled by the breeze, struck together, making sounds which the priests explained. At Delphi, the most famous of all, sacred to Apollo, the Pythia or priestess sat upon a tripod over the mouth of a cleft in the rock, whence issued a gas which, it is said, caused her to fall into convulsions; her ravings were translated in the responses by the attendants. Certain oracles pretended to speak with the voices of the dead. At Præneste, near Rome, the goddess Fortune was consulted by means of throwing certain lots. In the early period of Greek history the Delphic and other oracles exerted great influence. They were generally couched in ambiguous language: those at Delphi, and generally those at Dodona, were given in hexameter verse. Sometimes the shrine is termed an oracle. See DELPHI, DODONA, FORTUNA, TROPHONIUS.

**Oral Pole,** or AREA. Part of the body on which the mouth is in polyps.

**Orange.** *Citrus aurantium.* Small tree of the natural family *Rutaceæ*, native of India; extensively planted in all warm countries for its fruit, of which there are numerous

Orange (*Citrus aurantium*).

varieties. It is closely allied to the citron, lemon and lime. Oranges are evergreen, and bear fruit and flowers simultaneously. They have been extensively cultivated in Florida and Louisiana; in the former the trees were killed by the frost in 1895.

**Orange.** City of Essex co., N. J., 12 m. w. of New York; part of Newark till 1806. Pop., 1890, 18,844.

**Orange.** Former principality in s.e. France; claimed by the princes of Nassau from 1531; ceded to France 1713.

**Orange.** River of s. Africa. It rises in the mountains of Natal and the Transvaal, and flows generally w. to the Atlantic. Length ab.1,150 m., drainage area 400,000 sq. m.

**Orange III.** See HELIANTHIN.

**Orange,** FORT. Erected 1623 by Dutch W. India Co. near site of Albany, N. Y.

**Orange,** PRINCE OF. See WILLIAM OF NASSAU and NASSAU.

**Orange Free State.** Republic of S. Africa, lying between Cape Colony and the S. African republic. The surface is high (altitude 4,000 ft.) and is an undulating plain. It was founded 1836 by Boers from Cape Colony. They speak a corrupted Dutch dialect, and are nomadic and agricultural. Area 48,000 sq. m.; pop., 1890, 198,503, of whom 77,716 were white.

**Orange Grass.** *Sarothra gentianoides.* Herb of the St. John's Wort family, native of e. N. America; known also as Pine-weed.

**Orangemen.** Association of Irish Protestants, first so called after 1688, as favoring William of Orange against the Stuarts. The first Orange Lodge was formed in n. Ireland 1795. In 1835 there were 1,500 lodges in Great Britain and Ireland, in 1861 150,000 members in Canada. Its great days are Nov. 5, date of William's arrival at Torbay, July 1 and 12, battles of Aughrim and the Boyne. Riots sometimes attend their celebrations, as in New York July 12, 1871. See RIBBONISM.

**Orange Oil.** Extracted from orange-peel and water by distillation. It is fragrant.

**Orange-Root.** *Hydrastis canadensis.* Herb of the Buttercup family, native of e. N. America; known also as Yellow Puccoon.

**Orang-Utan** (SIMIA SATYRUS). Tailless Ape of Borneo, standing 4 ft. high, having long arms, with a span of over 7 ft. The thumbs and great toes are relatively short. The face is naked, the hair reddish brown, not abundant on the body. Adult males have a long beard. They live in jungles and sleep in nests high up in trees. In shape their brain approaches nearest to man's of all Apes.

Orang-Utan.

**Oratorio.** Species of combined literary and musical entertainment, named from the oratory of St. Philip Neri in Rome. Though evidently an offspring of the mysteries, moralities, and miracle plays, the oratorio is traced from the dramatic representations with which Neri varied his religious instructions. As an art-form it has a history contemporary with that of the opera: the first was produced in Rome by Emilio del Cavalieri 1600; it was called *La Rappresentazione dell'Anima e del Corpo*, and employed all the elements found in operatic representations. In time the employment of scenery and action fell into disuse, and the oratorio took on the narrative or epical character which now distinguishes it from the opera, but a tendency toward the drama is visible in the sacred operas encouraged by Rubinstein, which deal with subjects borrowed from sacred story, and illustrate incidents which are not presented to the eye, many being impossible of scenic realization, but put before the imagination by means of stage directions. The Passions, also called Oratorios, had an independent origin in Germany, having grown out of an ancient church service. Handel, whose *Messiah* is the most familiar and popular oratorio extant, developed the form to its perfection in Italy. The composers most intimately identified with the history of oratorio were Cavalieri, Carissimi, Allessandra Scarlatti, Caldara, Leo, Stradella, Sachini, Paisiello and Hasse in Italy, Schütz, Keiser, Mattheson, Bach, Graun, Haydn, Spohr, Mendelssohn, Rubinstein and Liszt in Germany, Handel, Bennett, Sullivan and MacKenzie in England.

**Oratory.** Place for prayer; small room used for devotion, whether in a dwelling, convent, or church.

**Oratory,** PRIESTS OF THE. Order following a rule and obeying superiors, but taking no vows and retaining their property; founded by St. Philip Neri 1561.

**Orbegozo,** LUIS JOSÉ, 1795–1847. Pres. of Peru 1833, and under the confederation with Bolivia till 1838; exiled 1839.

**Orbigny,** ALCIDE D', 1802–1857. French naturalist, who made an exploration of S. America 1826–33; prof. at the Museum of Natural History, Paris, from 1852. *Paléontologie Francaise*, 14 vols., 1850–54.—His brother, CHARLES, b. 1806, wrote on geology and paleontology, especially on the Ammonites.

**Orbilius,** PUPILLUS, ab. 113–ab. 15 B.C. Grammarian at Rome from 63 B.C.; teacher of Horace.

**Orbit.** Path which a planet or comet describes about the sun. If undisturbed, this would be an ellipse, hyperbola, or parabola.

**Orbitelariæ.** See SPIDERS.

**Orcagna,** ANDREA (DI CIONE), ab. 1316–1376. Florentine painter and sculptor. The fine tabernacle in Or San Michele at Florence is his work. In painting he follows the methods and spirit of Giotto. His authentic pictures are not numerous; the best known are the frescoes of the Strozzi Chapel in Santa Maria Novella, Florence. The frescoes in Pisa long attributed to him are no longer considered his.

Orcagna.

**Orchard Grass.** *Dactylis glomerata.* Strong growing, early, and nutritious grass. It is more valuable as meadow than as pasture grass, and is very objectionable as a lawn grass, from its habit of growing in tufts.

**Orchardson,** WILLIAM QUILLER, D.C.L., b. 1835. Scottish genre painter, of first rank within the limits of his school; in London since 1863; R.A. 1877.

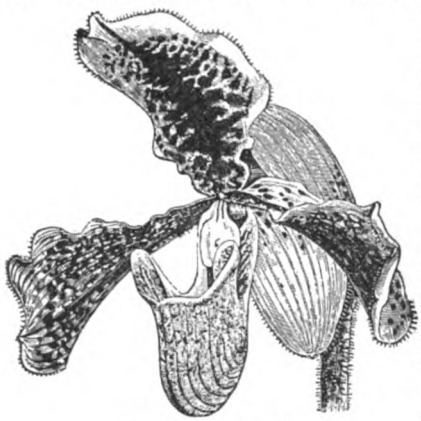
**Orchestra.** Company of instrumental musicians employed in theater, opera, or symphonic concerts, distinguished from bands. Most of the players use instruments of the viol family, of which four varieties are employed, viz., violins, violas, violoncellos, and double-basses. These are all used in numbers, and form a choir called the Strings. A second choir is composed of the wind instruments of wood, viz., flutes, oboes, clarionets, and bassoons, with their related forms, the piccolo flute, English horn, corno di bassetto, bass clarionet, and contra-bassoon, collectively called the Wood-winds; a third choir are the brasses, viz., cornets or trumpets, horns, trombones, and tubas, with their variations. Finally, there are the instruments of percussion, ordinarily limited to a pair of kettle drums. Practically the range of the orchestra is coextensive with that of the pianoforte. The wood-winds are generally represented in pairs, though the number of each is sometimes doubled for the purpose of maintaining a balance with the strings, which normally make up three-fourths of an orchestra.

**Orchestration.** Art of writing music for the various instruments of an orchestra. It is a work of detailed elaboration, which follows the conception of a composition and frequently its completion, at least in sketch form. Skill in the art is conditioned upon knowledge of the capacity of the various instruments composing an orchestra and their characteristic qualities of tone, singly and in combination. Text-books on it have been written by Berlioz, Gevaert, E. Prout, and F. Corder.

**Orchidaceæ.** Natural family of flowering plants, of the class *Angiospermæ* and sub-class *Monocotyledons*, comprising ab. 370 genera and 5,000 species, very widely distributed through the temperate and warmer regions of the earth; called the Orchid family.

**Orchidaceous.** Pertaining to or resembling orchids; especially their corollas.

**Orchids.** Plants of the natural family *Orchidaceæ*, bearing showy, irregular flowers, of wide geographical distribution and extensively cultivated, many of the tropical species being remarkable epiphytes, adhering to trees and rocks and deriving their sustenance from the atmosphere; hence called air-plants.



Cypripedium boxallii.

**Orchil.** *Roccella tinctoria.* Lichen of the n. hemisphere, yielding a dye-stuff.

**Orchis** (CRANE-FLY). *Tipularia unifolia.* Green-flowered herb of the natural family *Orchidaceæ*, native of low woods in e. N. America.

**Orchomenus.** In Bœotia. City of pre-Homeric times, destroyed by Thebes 367 B.C. Here Dr. Schliemann excavated 1880 a royal tomb of the bee-hive type, with decorations influenced by Egyptian style.

**Orcin.** $CH_3.C_6H_3:(OH)_2$. Dihydroxytoluene; white crystalline substance of a sweetish taste, used in the manufacture of artificial dye-stuffs; prepared from toluene, or by fusing extract of aloes with caustic potash. It occurs in the lichens from which archil and litmus are made; ammonia and air convert it into orcein, $C_{28}H_{24}N_2O_7$, which forms red dyes.

**Orcus.** Pluto, or Hades.

**Ord,** EDWARD OTHO CRESAP, U.S.A., 1818–1883. Major-gen. U.S. Vols. 1861–66, holding commands in Miss. and Va.; Brig.-gen. U.S.A. 1866; retired 1880.

**Ord,** GEORGE, 1781–1866. American naturalist, biographer of Alexander Wilson, parts of whose *Ornithology* he edited 1813–25.

**Ordeal.** Primitive form of trial by appeal to divine intervention; known among ancient nations; often resorted to in Europe through the Middle Ages. There were various forms: trial by battle, still surviving in the duel; by fire, or boiling water or oil, immunity being a proof of innocence; by cold water, innocence shown by the sinking of the accused; by bread, the guilty being supposed unable to swallow a piece over which certain adjurations had been said; by the bier, blood flowing from a murdered body when touched by the murderer; and others. The ordeal was sometimes used by church officers, but from the 6th century was disapproved by the popes. Trial by battle was not actually abolished in England till 1819.

**Order.** Group of animals or plants, composed of families having common characters; subdivision of a class. *E.g.*, the class *Reptilia* includes the orders Snakes, Lizards, Turtles, and Crocodiles.

**Order.** In Classic Architecture, this denotes a column with its support and entablature. According to the form of these members, and especially of the capital, a building or a single range of columns is said to be of the Doric, Ionic or Corinthian, or, in Roman architecture, of the Tuscan or the Composite order.

**Order.** In Law, direction by a court to pay money, deliver property, or the like.

**Order,** IN MATHEMATICS. The basis of classification varies with the character of the subject matter. Series have orders dependent upon the number of constant elements forming the law of the series. Orders of loci depend upon the degree of the equation which gives the law of the locus. The order of contact between the curves refers to the number of successive derivation of their common ordinate, which are equal. The order of a determinant depends on the number of elements involved.

**Ordericus,** VITALIS, 1075–ab. 1143. Historian of Normandy, where he was a monk of St. Evroul, and of his native England. His book, pub. 1619, tr. 1853–56, is of value chiefly from 1066 on.

**Orderly.** Soldier detailed to report to an officer to carry any military order or perform any personal service; also one designated to be responsible for the orderly character of quarters occupied by several.

**Orderly Sergeant.** First sergeant of a company, troop, or battery in the U. S. service.

**Order of Battle.** Tactical disposition of the different parts of an army preparatory to offering battle. The principal orders are the parallel, the oblique, the convex, and concave.

**Orders,** GENERAL. Announce the time and place of issues and payments, hours for roll calls and duties, police regulations and prohibitions, returns to be made and their forms, laws and regulations for the army, promotions and appointments, eulogies or censures, the results of trial by general courts-martial in all cases of officers or of soldiers involving matters of general interest and importance, and, generally, whatever it may be important to publish to the whole command. Special orders are such as concern individuals or relate to matters that need not be made known to the whole command.

**Orders,** MILITARY. That of St. John of Jerusalem, known as Hospitalers, Knights of Rhodes and of Malta, was founded 1120 or earlier. The TEMPLARS (q.v.) were organized 1119–28, and destroyed 1308–15. See also TEUTONIC KNIGHTS.

**Orders in Council.** Instructions or regulations of Privy Council, either under authority of Parliament or by exercise of the royal prerogative.

**Orders of Architecture.** See ARCHITECTURE.

**Orders of Goods.** See GOODS.

**Orders of the Ministry.** In most Protestant bodies one, Presbyter; in the Anglican three, Deacon, Presbyter, and Bishop; in the R. C. these with four MINOR ORDERS (q.v.).

**Ordinance.** In Architecture, the arrangement or composition of an order.

**Ordinance.** Local regulation by a municipality.

**Ordinance of 1787.** Passed by Congress July 13, regarding the Northwest Territory.

**Ordinary.** In the Roman Empire, judicial officer of original jurisdiction, generally pres. of a province; in canon law, bishop of a diocese; in modern law, officer who has succeeded to the bishop's jurisdiction over probate and divorce causes.

**Ordinary Ray.** See DOUBLE REFRACTION.

**Ordinate.** One of two lines determining position in Cartesian Coördinates. The ordinate of any point is its distance from the axis of abscissas, measured on or parallel to the axis of ordinates.

**Ordination.** Designation, usually by imposition of hands, to an ecclesiastical office, especially that of Presbyter; commonly regarded as availing for the whole life.

**Ordnance.** See CANNON, HOWITZER, and MORTAR.

**Ordnance and Ordnance Stores.** Include cannon and artillery carriages and equipments, and all property supplied by the Ordnance Department.

**Ordnance Department.** Staff Corps of U.S. army under one chief (Brigadier-general), charged with procuring and distributing the necessary ordnance supplies for the Government, and care of arsenals and depots for their manufacture and safe keeping. The arsenals and depots are at Allegany, Pa.; Augusta, Ga.; Benicia, Cal.; Columbia, Tenn.; Fort Monroe, Va.; Philadelphia, Pa.; Indianapolis, Ind.; Augusta, Me.; Governor's Island, N.Y.; Rock Island, Ill.; San Antonio, Texas; Sandy Hook Proving Ground, N. J.; Springfield, Mass.; St. Louis Powder Depot, Mo.; U. S. Powder Depot at Dover, N. J., Watertown, Mass., and West Troy, N. Y. During the fiscal year ending June 30, 1893, the expenditures were $3,702,000.

**Ordnance Survey.** Government survey of Great Britain, first completed in 1755, under the direction of the Ordnance Department; since elaborated.

**Ordovician.** Cambro-Silurian or Lower Silurian rocks of earlier writers; broadly subdivided thus: (See COLUMN.)

| New York | Britain | Bohemia | Sweden |
|---|---|---|---|
| Hudson River, Utica, Trenton | Caradoc | Étage D of Barrande Second Fauna | IV, V, VI. of Angelin Regions B.C. C. and D. |
| Birdseye | Upper Llandeilo | | |
| Black River | Lower Llandeilo | | |
| | Arenig | | |
| Chazy | | | |
| Calciferous | | | |

**Ore.** Mineral matter containing a useful or valuable metal in quantity sufficient to make its extraction commercially profitable; often, any mineral that contains a large percentage of metal, whether occurring in large quantity or not. The metal in an ore is usually chemically combined, as with oxygen, sulphur, tellurium, or other so-called mineralizing ingredient, though it sometimes occurs in its metallic state, uncombined with any other chemical element.

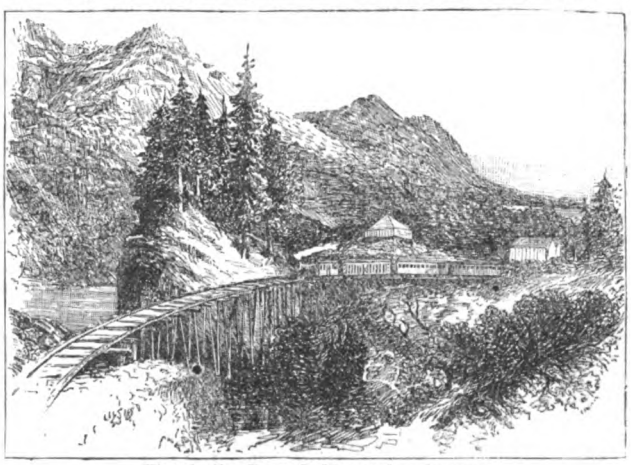
**Oreads.** See NYMPHS.

**Ore Deposits.** Body of ore in its natural place in the crust of the earth. Broadly speaking, ores are usually found locally concentrated in masses more or less sharply distinguishable from the adjacent non-metalliferous rock. They differ widely in richness, extent, form, and origin. Beds and veins,

which agree in having great length and breadth compared with their thickness, are the most common modes of occurrence, though many modifications of these typical forms are recognized. Mass deposits, segregations, impregnations, bunches, pockets, nests, etc., are irregular in shape. No single theory of origin applies to all deposits, and no one classification has met with universal approval. The literature of ore-deposits is extensive. Among many writers on this branch of economic geology may be mentioned Burat, von Cotta, Gaetzschmann, Grimm, von Groddeck, Henwood, Kemp, Köhler, Phillips, Posepny, and Whitney. Valuable descriptions of individual deposits, and elaborate discussions of theories, are to be found in the reports of geological surveys, in scientific and technical periodicals, and in the transactions of societies.

**Ore Dressing.** Operations of breaking, crushing, washing, sizing, sorting, etc., employed in separating ore from worthless rock, or in bringing a portion of the ore to a state of greater richness.

**Oregon.** One of the western States, on the Pacific coast. Along the coast extends a low range of mountains or hills, which may be considered as an extension n. of the Coast Ranges of Cal. E. of this is the valley of the Willamette, which may be considered a continuation of that of Cal. This is succeeded e. by the Cascade Range, a broad volcanic plateau, above which rise volcanic peaks, and from which one descends to the great semi-arid plateau occupying the e. two-thirds of the State. In the n.e. part of this area rise the Blue Mts., with heights of perhaps 9,000 ft. The s. part of this plateau forms part of the Great Basin; the n. and e. parts are drained to the Columbia and Snake rivers. Its industries consist in the main of agriculture, with salmon fisheries and lumbering. O. originally included all the territory n. of the



View in the Cascade Mountains, Oregon.

42d parallel between the Pacific and the Rocky Mts., and was claimed by the U. S. as part of the Louisiana purchase. Serious and prolonged complications over the territory arose with England, which laid claim to the territory by reason of alleged prior discovery and settlement. The difficulties were provisionally adjusted 1818 by a treaty of joint occupation, and 1846 by a treaty in which England recognized the 49th parallel of latitude as the n. boundary of the U. S. O. was organized as a territory 1848, and admitted as a State 1859. Railroads, in 1894, 1,481 m. 430,000 cases of salmon were shipped in 1890. Area 96,030 sq. m.; pop., 1890, 313,767. Capital, Salem.

**Oregon River.** See COLUMBIA.

**O'Reilly,** JOHN BOYLE, 1844–1890. Irish-American poet and journalist. A soldier and a Fenian, he was convicted of high treason 1866, and after a year's imprisonment was sent to western Australia, whence he escaped 1869. From 1874 he was owner and editor of the Boston *Pilot*.

**Orel.** City of Russia, on the Oka, 222 m. s.w. of Moscow; mainly burned 1848 and 1858. It has a large trade and some manufactures. Pop., 1890, 79,135.

**Orélie Antoine** (CHARLES DE TONNEINS), 1820–1878. French adventurer, King of Araucania (Patagonia) 1861; deposed by Chili and deported.

**O'Rell,** MAX. See BLOUET, PAUL.

**Orellana,** FRANCISCO DE, d. ab.1546. Companion of Pizarro in Peru; first explorer of the Amazon 1541.

**Orelli,** JOHANN KASPAR VON, 1787–1849. Prof. at Zurich from 1819: editor of Cicero, Horace, and Tacitus. *Latin Inscriptions*, 1828.

**Orelli,** KONRAD VON, Ph.D., b. 1845. Prof. Basel 1873. *O.T. Prophecy*, 1882, tr. 1885; commentaries on the Prophets, 1887–88.

**Orenburg.** Town of e. Russia, on the Ural; built 1743. It has considerable trade. Pop., 1891, 62,534.

**Oreodon.** See OREODONTIDÆ.

**Oreodontidæ.** Family of Bunodont, even-toed Ungulates, represented by fossils from the Miocene and Pliocene formations of N. America. They combine characters of the Swine and Ruminants. *Oreodon* was of the size of a sheep, had four-toed feet and complete dentition, which departs from the true Bunodont type in being like that of Selenodonts.

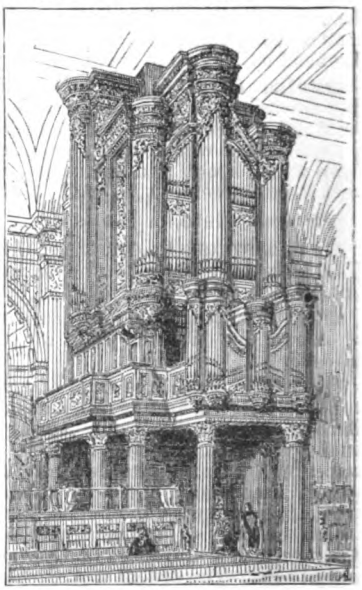
**Orestes.** Subject of several Greek tragedies: son of Agamemnon and Clytæmnestra; saved from death by his sister Electra. He avenged his father's murder by slaying his mother and her paramour Ægisthus, was struck with madness and pursued by the Furies, but was acquitted by the Areopagus, and recovered his father's kingdom at Mycenæ.

**Orfila,** MATHIEU JOSEPH BONAVENTURE, 1787–1853. Minorcan physician and scientist, prof. Paris from 1819; writer on medicine and chemistry. *Toxicologie*, 1813.

**Orford.** See WALPOLE.

**Organ.** See ORGANOGENY.

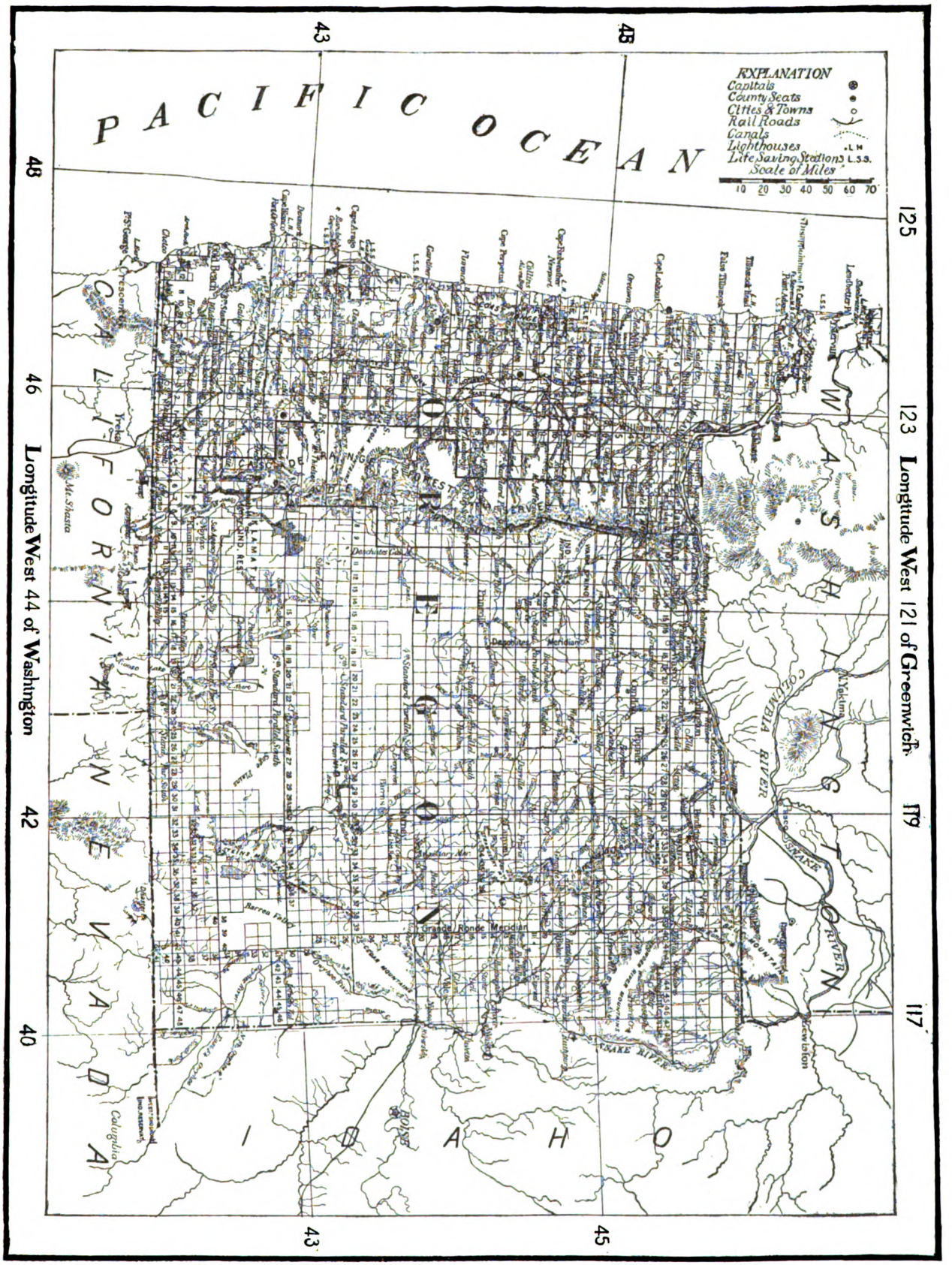
**Organ.** Most complete and capacious of instruments of music. Its fundamental principle is that exemplified in the ordinary toy whistle. It is therefore a wind instrument, its multitudinous voices being produced by the admission of air into the pipes from a magazine (wind-chest), into which it has been forced by bellows. The opening and closing of the pipes is accomplished by valves or slides, controlled by the fingers and feet of the player through the agency of keyboards, of which there are from two to five, one for the feet (pedals), the others for the hands (manuals). The pipes, which mount to thousands in the case of large instruments, are varied in size, to obtain degrees of pitch, and in material, shape, and device for the sake of variety in tone color. A distinction is made between flue pipes, in which the sound is produced by a current of air impinging on the upper lip of the pipe, as in the case of the ordinary whistle, and setting the column of air in the tube to vibrating, and reed pipes, in which the sound is the result of the vibration of a tongue of metal, technically called a reed, inserted in the lower end of the pipe and agitated by the wind. The various systems of pipes are brought into service as required by means of mechanical devices, of which the commonest is the draw-knob. The organ in its simple form is an instrument of great antiquity. It seems to have been introduced in the Ch. ab. 650. See ORGAN PIPE.



The New Organ in the Church of St. Lawrence Jewry, Gresham St., London, Eng.

**Organic Chemistry.** Branch dealing with the transformation and decomposition of the hydrocarbons and their derivatives. Till 1828 it was held that organic compounds were fundamentally different from the inorganic or mineral substances, in that they were only found in living things, plants, and animals, and were therefore necessarily elaborated under the influence of the life force or vital principle. It was further held that no organic compounds could exist without the intervention of this life force. In 1828 Wöhler succeeded in preparing urea artificially. In rapid succession a large number of the compounds occurring in plants and animals were made by synthetical operations in the laboratory. At present large factories are engaged in the production of coloring matters, flavoring extracts, perfumes, sweetening substances, etc., formerly obtained from plants. There are now ab. 200 hydrocarbons known. Upon oxidation each yields an alcohol. These in turn yield an aldehyde, and then an acid. The alcohols also yield ethers. The hydrogen in all these compounds may be replaced by the halogens or radicals. With every alcohol and most of the metals the acids yield derivatives. New substances and new classes of substances are being discovered daily; the field is constantly widening, and is engaging the attention of a large majority of chemists.

**Organic Radicle.** See RADICLES.


PACIFIC OCEAN
EXPLANATION
Capitals
County Seats
Cities & Towns
Rail Roads
Canals
Lightheuses
Life Saving Stations
Scale of Miles
10 20 30 40 50 60 70
CALIFORNIA
NEVADA
IDAHO
WASHINGTON
OREGON
COLUMBIA RIVER
SNAKE RIVER
Longitude West 121 of Greenwich
Longitude West 44 of Washington
125
123
119
117
48
46
43
42
40
45

**Organism.** Unit of being, animal or vegetable, whether a single cell or group of complex organs; the individual of any species. Micro-organism is used to designate organisms only visible by aid of the microscope without classifying them as animal or vegetable.

**Organization of Industry.** Increased productivity and diversification of the industrial system, arising not from efficiency of individual laborers, but from division of labor, introduction of competition, and growth of an employing class.

**Organization of U. S. Army.** The present organization comprises 3 Major-generals, the senior commanding the army, the remaining 2 Major-generals and 6 Brigadier-generals commanding the 8 Military Departments into which the country is divided; Depts. of the Adjutant-general, the Inspector-general, the Judge Advocate-general, and the Quartermaster-general; Subsistence, Medical, and Pay Depts.; Corps of Engineers, Ordnance Department, Signal Corps, Record and Pension Office, Post Chaplains, and Military Academy; 10 Regiments of Cavalry, 5 of Artillery and 25 of Infantry. The troops are scattered all over the country in the military posts, not exceeding one regiment at each. The Departments are: 1. Department of the East, comprising New England, N.Y., N.J., Pa., Del., Md., Va., W.V., N. and S. C., Ga., Fla., La., Miss., Ala., Ky., Tenn., O., and the Dist. of Col., Headquarters at Governor's Island, N.Y. 2. Department of the Missouri, comprising Mich., Wis., Ind., Ill., Mo., Kan. and Ark., and the Ind. and Ok. Terr., Headquarters at Chicago. 3. Department of Dakota, comprising Minn., N. and S. Dak., and Mont., Headquarters at St. Paul, Minn. 4. Department of the Colorado, comprising Col. and Utah and the Terr. of Ariz. and N. Mex., Headquarters at Denver, Col. 5. Department of the Columbia, comprising Or., Wash. and Idaho and Terr. of Alaska, Headquarters at Vancouver Barracks, Wash. 6. Department of Cal., comprising Cal. and Nev., Headquarters at San Francisco, Cal. 7. Department of Texas, Texas, Headquarters at San Antonio. 8. Department of the Platte, comprising Ia., Neb. and Wy., and part of Idaho not in the Department of the Columbia, Headquarters at Omaha, Neb. There are 84 garrisoned posts and 42 posts not garrisoned. The 10 cavalry have 434 commissioned officers and 6,170 enlisted men, total 6,604: the 5 artillery have 283 commissioned and 4,025 enlisted, total 4,308: the 25 infantry have 877 commissioned and 13,125 enlisted, total of 14,002: the engineer battalion has 13 commissioned and 500 enlisted, a total of 513. The total strength of the army is 2,131 commissioned, 25,000 enlisted, 7 professors and 330 cadets of the Military Academy, 109 Indian scouts and soldiers, or a total of 27,577.

**Organ Mountains.** 1. Near the e. coast of Brazil, 40 m. n.e. of Rio de Janeiro; their peaks, as seen from Rio, resemble the pipes of an organ. Highest point 7,500 ft. 2. Mountain chain in the w. of Cuba.

**Organ of Corti.** See CORTI, ORGAN OF.

**Organogeny.** Production of organs. An organ is a definite, individual portion of organisms or individuals, which does a specific work needed for the welfare and integrity of the person (or bion).

**Organography.** Study of the organs of plants, *i.e.*, root, stem, leaves, flowers, fruit, seed.

**Organo-Metallic Compounds.** Substances composed of a metal and an organic radical, as zinc ethide, $Zn(C_2H_5)_2$.

**Organ Pipe.** Tube of wood or metal, which in an organ contains a column of air capable of being set in vibration by a suitable mechanism at one end, called the mouthpiece. The pitch of the note decreases as the length of the column increases; also if the pipe be closed at the top its pitch is one octave lower than if open. See REED.

**Organ Point.** In Music, a note, generally in the bass, which is sustained unaltered while a long series of harmonies are woven above it. The effect is most frequently employed to develop a climax toward the close of a composition.

**Organum.** Early kind of harmony, consisting in a second melody so within that it would parallel a first at the interval of a fifth above or a fourth below.

**Orgetorix.** Helvetian who induced the migration of the Helvetii into Gaul ab. 59 B.C., though he died before this was accomplished. They were the first to encounter Cæsar.

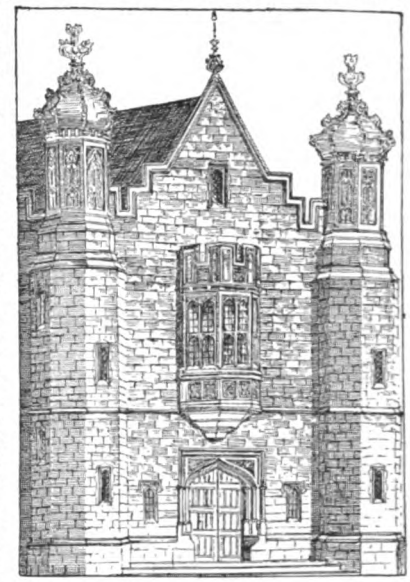
**Orgies.** Secret rites or customs connected with the worship of the pagan deities. See BACCHANTES, MÆNADS, and MYSTERIES.

**Oriani,** BARNABA, COUNT, 1752–1832. Italian writer, chiefly on astronomy.

**Oribasius,** 326–403. Greek of Pergamus, physician to Julian. His surviving works were pub. in 6 vols. 1852–76.

**Oribe,** MANUEL, d. 1857. Revolutionist of Uruguay, employed against his country 1841–51 by Rosas, the Argentine dictator.

**Oriel.** Window projecting from the face of a wall, above the ground. It may be segmental or polygonal in plan. A bay-window is not an oriel, but stands upon its own separate foundations.



Oriel.

**Oriental Literature.** This includes Chinese, Sanskrit, Arabic, and Persian. That of China is best known in the writings of Confucius, the celebrated Chinese philosopher. Its most ancient monument is the *King* or Sacred Books, dating from ab. 2000 B.C., but collected and completed by Confucius. The later Chinese literature comprises poetry in lyric and dramatic forms, and romances. Sanskrit literature is that of ancient India, and is contained in the *Vedas*. Critics are divided as to their date. The Vedic hymns, first in origin, were followed by an epic period, in which poets like Valmiki wrote. There are also dramatic works, as the *Sakuntala*, and a body of romantic poetry. Its most voluminous productions are found in the *Brahmanas*, the *Sutras*, and the *Upanishads*, the commentaries on the *Vedas*. In Arabic literature two periods are distinctly marked. Of the first, that before Islamism rose, the noted work is *Moallakât*, dating from the 6th century, a collection of poems by unknown authors. The second period begins with the Koran, and is rich in histories and romances. Persian literature has for its most ancient work the sacred books attributed to Zoroaster, the *Zend Avesta*. In its later growth the fable and the epic are prominent, and it is specially rich in lyric and elegiac verse. It has also many romances and tales, as the work of Firdausi. The historical novel is said to have originated here.

**Oriental Province,** or INDIAN PROVINCE. Zoölogical region including s. Asia and the Indian Archipelago (Borneo, etc.). Characteristic animals are the Indian buffalo, elephant, tiger, and pea-fowl.

**Orientation.** Process of placing a map or chart so that each line upon it is parallel to the corresponding line upon the ground, or placing a surveyor's transit so that the n. point of the circle coincides with the meridian.

**Orientius.** Gallic author of *Commonitorium*, a Christian poem, probably of 5th century, pub. 1888.

**Orifice.** See CONTRACTED VEIN and FLOW THROUGH AN ORIFICE.

**Oriflamme.** Banner of red silk, once belonging to the Abbey of St. Denis; made the royal standard by Louis VI. of France in 1124.

**Origen,** 185–254. Alexandrian presbyter, greatest of the Greek Fathers; called by F. D. Maurice "the man who had done more than all others to promote the study of the divine oracles, the teacher of pagans, strengthener of Christians, converter of nations." He taught at Alexandria and Cesarea, and was a confessor in the Decian persecution.

**Origin.** Fixed point in bilinear coördinates, determined by the intersection of the axes of reference.

**Original Sin.** Innate depravity; diseased condition of the soul, inherited from Adam. The Augsburg Confession says that this "is really sin, which condemns and causes eternal death." Arminians regard it as inherent, not as imputed, a defect of nature, not involving guilt.

**Orinoco.** River of Venezuela. It heads in the Sierra Parime, flows at first w., then n., and finally e. to the Atlantic, which it enters through an extensive delta. Near its head its waters divide, a small portion going off to the Amazon by way of the Casiquiari and Rio Negro. Length ab. 1,550 m. It is navigable for most of its course excepting the rapids, which